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SIMPLIFYING SMALL CENTRAL STATIONS.

For many years to come the small central station will be an important factor in the production and distribution of electrical energy, notwithstanding the tendencies of the times toward consolidation of plants and the concentration of generating capacity in large installations serving great areas. Simple methods of operation are accordingly important features of practice and deserve to be encouraged in face of the constant temptation toward the installation of highly complex and automatic apparatus. In a representative small plant examined not long since, no less than five voltages were in use, ranging from 13,200 to 100. The intermediate pressures employed were 6,600, 2,300 and 550 volts, and as a result, the complications of the plant in transformer equipment and switchboard cost were excessively great. The market supplied was a semi-rural community, including a little street railway service reaching its maximum in the summer season, a small manufacturing town and an outlying district containing a number of quarries and stone-cutting establishments.

It appeared from the examination that the plant could be much improved by the elimination of the 6,600 and 550-volt distributing lines in its immediate vicinity and the installation of step-down transformers at motor-using points, the primaries running at 13,200 volts throughout the quarry district. Local lighting and small power service was desirable at 2,300 volts in the vicinity of the plant, but it appeared that the intermediate pressures employed might well be eliminated in favor of simplified operation. The latter was desirable through its relation to a less costly expansion of the plant and incidentally through the reduction of accident hazards in the station and the improvement of the overhead system of distribution, especially in the face of increasing loads. In the station there were no switches on the outgoing 13,200-volt lines, and the switchboard arrangements were decidedly unsatisfactory, making the correct handling of the plant much more difficult in emergencies than in a simpler and more clear-cut installation. The transformers were so crowded that some of the larger units were installed upon a gallery near the roof, resulting in great difficulty of access and poor ventilation. The operation of so many different electrical pressures made economical service by individual transformer banks troublesome to obtain, since only on rare occasions could the various groups of apparatus be simultaneously operated at loads approxi-

mating their normal ratings. Room for crane operation was also difficult to secure on account of the wiring and transformer arrangements, and at last accounts no means of quickly handling defective transformer units was available.

The process of simplifying the small plant should not, however, extend to the instrumental side of its work so far as to avoid the use of proper devices for checking the processes between coal pile or oil tank and the busbar. The cost of flue-gas recorders, water meters, thermometers and electrical recording apparatus, permitting a close check upon plant performance at every important step, is too small a percentage of the total to justify omissions of this character. In the plant above criticized oil engines were used, but the water-cooling system was not piped for flexible operation and too much dependence was placed on a single line of supply piping. The cost of duplicating such auxiliary service is too small to be objectionable in the most energetic campaign for simple operating conditions, and a sense of proportion is as important a factor in the betterment of small plants as in every other human activity.

THE SMALL DEALER'S ADVERTISING.

No large dealer needs to be told of the importance of systematic advertising. In fact, concerns that fail to appreciate its importance seldom become large.

Successful advertising is a thing that requires careful attention and good judgment. The selection of the best medium for advertising, the preparation of the copy, the best time to give this or that article or line prominence in the advertising—these are all matters that demand constant consideration. Each small dealer in electrical supplies in the small town has depended largely upon his own originality in matters of this sort. It is true, of course, that the manufacturers have helped him; but a thing that he has needed very much has been a freer exchange of ideas growing out of the experiences of other dealers of his own class—more suggestions that apply especially to the business of the dealer of limited capital in the small town. Some interesting suggestions of this sort are to be found in the short article on "The Small Dealer's Advertising," by Mr. Richard E. Smith, which appears on another page of this issue.

Mr. Smith's criticism of the practice on the part of the electrical contractor of taking work at a figure that is too low, in the hope that the job will have a compensating advertising value, would seem to be particularly timely. The average contractor does not need an increased volume of business nearly so much as he needs better prices for the work he installs. A job done well at a low price may indeed attract the attention of other possible customers, but, nine times out of ten, new prospects thus attracted will insist on the same low figure allowed on the first job, and attempts to explain to them how that job was taken can usually be depended upon to turn out to be the essence of futility.

Another thing in Mr. Smith's article that strikes one as being especially worth consideration is his suggestion about misdirected efforts to attract the reader's attention. Every piece of advertising copy should be an attention-compelling one, of course, but the man who prepares it should take care that attention is going to be centered upon the thing advertised rather than upon the advertisement. The other lay there appeared in one of the magazines devoted to steam engineering in a page "ad" of some specialty or other used in the engine room which began with an illustrated story about the manufacture of typewriters. The story was so complete and the connection between it and the rest of the page so slight that the inducement to the reader to finish the page was obviously lacking. It is a safe guess that half the engineers who saw that page remembered well the story about typewriters and immediately forgot what it was that was being advertised and whose advertisement it was.

Attempts at humor, to which Mr. Smith calls attention, is a practice which the novice at "ad" writing seems especially liable to overdo. Here there is the additional danger that his humor will fail to be humorous, and that the effectiveness of the copy will be thus lost. Good advertising copy must be of a kind to draw the reader's attention to the advertisement and then to focus it on the commodity for sale. The preparation of this is an art, and it's well worth while for the small dealer to study it.

ASSOCIATING ELECTRICAL SERVICE WITH SMALL COSTS.

One of the most effective methods of advertising electrical service for the benefit of the general public is by emphasizing the quantity of such service which can be purchased for small sums of money. An appeal to the average newspaper reader on behalf of a flatiron, toaster, sewing-machine motor or lighting installation commands instant attention, if the reader's eye is focused upon the cost side of the question. He may skip over sentences of cleverly arranged text, but if the element of low price is inserted at the proper points his curiosity is almost sure to be aroused and a lasting impression made favorable to the use of electricity.

Thus, an effective advertisement by a central station recently stated that at the prevailing rates 30,000 stitches could be had from a motor-driven sewing machine for one cent, covering the sewing of 300 feet of cloth. This was display publicity of the most efficient type, for it interested the reader from the start. Again, there are rich sources of material in the publication of operating costs of electrical appliances like percolators, low candlepower tungsten lamps, porch lights, fans and flatirons. Many people do not know, for example, that where electricity is sold at 10 cents per kilowatt-hour a 100-watt tungsten lamp can be run an hour for one cent;

that a 10-watt lamp can be left burning all night in a bath room or hall for this trifling amount; or that a 60-watt lamp under a dining-room canopy can be operated through an evening dinner lasting an hour and a half for less than half the cost of a single egg under the most favorable market conditions found in the usual city. In comparison with the total expense of a meal, whether for lighting or cooking, electric service is thus almost nominal.

Now, to every technical man such figures as the foregoing may seem almost ridiculously simple—he takes them for granted or determines such costs by mental calculations of a few seconds' duration—but the truth is that the layman has comparatively little idea of even these elementary matters and does not readily subdivide kilowatt-hours into watt-hours in considering current-consuming devices of various kinds. To show him just what can be done with small amounts of money in electric service and particularly in denominations which most people almost disregard from the standpoint of expenditure, is to hit the psychological nail squarely on the head and predispose the reader of the advertising medium selected by the central station to the use of service on a liberal scale. In the past much good has been accomplished by publicity showing what one kilowatt-hour will do in the way of service, and it is important that the public shall become as familiar as possible with this essential unit of commercial electrical service; but too much emphasis cannot be laid by central stations upon the purchasing power of the nickel, the penny and the dime in seeking to arouse a growing interest in their convenient and economical service.

ALTERNATIVE MOTOR DRIVE PROPOSITION.

In the great majority of cases where central-station power engineers investigate the comparative cost of existing methods of machine driving and submit a report to the prospective customer recommending the use of electric motors a single proposition only is presented for the latter service. The engineers in charge of the power survey indicate the engines, measure the friction losses in belts and shafting, determine the operating costs and fixed charges and then offer the prospective user of central-station service the scheme of motor driving which seems best adopted to the conditions, based upon their own experience in electrifying industrial plants. The result of this is sometimes unsatisfactory to the consumer-to-be, because he is not offered a flexible installation. In a nutshell, the problem is not worked out in more than one way and the psychological effect of offering the future purchaser of central-station service a choice of methods is lost. It is true, of course, that many problems of motor driving are so straightforward that only one solution is necessary.

A representative case occurred in connection with the investigation of central-station service for a three-story factory. In order to bring every possible argument to bear in favor of electrical operation and to give the "prospect" a choice of methods, the layout was worked up for both group and individual drive. In the first case, it was found that 17 motors aggregating 92 horsepower in rating would do the work. The maximum demand figured was 75 horsepower, and the average load, 40 horsepower. The cost of motors for this service was found to be $1,700 and the cost of wiring, $500, or $2,200 total investment. The operating cost per month was found to be $200, exclusive of fixed charges. Working the case out for individual electric drive it appeared that 45 motors aggregating 148 horsepower would be required for the service. These would cost the manufacturer $3,500, with $800 for wiring; and the maximum demand would be 55 horsepower, the average load, 25 horsepower, and the approximate cost of service, $135 per month. The two systems thus indicated would represent a total investment of $2,100 more for the individual drive. The fixed charges, assuming interest at six per cent, depreciation at five per cent, insurance and taxes at two per cent, or 13 per cent total, would be $273 heavier per year in case the individual drive were installed, but the saving in bills for electric service with the individual motor installation came to $780 per year, leaving a margin of over $500 in favor of the separate motor equipment.

Now in usual practice, the central-station presenting a proposition of this kind might determine for its own information the comparative costs of these two services as outlined above, but it would be likely to recommend the one involving the lower annual cost and omit reference to the group drive unless pressed to submit data by the factory owner. In the case cited above, the two estimates were included in the report to the prospect, and he thus had to make his own choice between a low initial expenditure with a comparatively high yearly cost and a higher investment with a correspondingly low outlay from the time of installation forward. It was a wise move to include both estimates, for in the case in point, the central-station engineers appreciated the fact that a small manufacturing establishment often cannot afford initially to lay out its equipment along the lines which a large concern would find acceptable; that the owners may prefer to operate at a somewhat higher power cost for a year or two in order to save in the investment; and finally, that the use of the group drive in no way prohibits the gradual changing over of the plant to individual motors as the business grows and as resources become larger. The central-station man who offers his prospective customer a choice of this kind in cases where the cost of the best possible engineering arrangement looks a bit large to the man of very moderate resources performs a real service and stands a better chance of capturing the business than the man who insists that but one solution of the problem should be considered.

Fire Nearly Destroys Massachusetts Plant.

The municipal light plant of the town of Peabody, Mass., was damaged by fire August 8, the damage amounting to about $50,000. As the result, the street lighting of the town has been entirely suspended, and will not be resumed for perhaps two or three weeks. Arrangements have been made by which the residence lighting is provided through connection with the Salem Electric Lighting Company's plant, and it is stated that probably the Salem company will furnish energy for power users. The plant supplied about 500 horsepower for manufacturing.

Spontaneous combustion is given as the cause of the fire, which seriously damaged the generators, engines, dynamos and switchboard. The plant is one of the oldest municipal plants in Massachusetts.

Russian Delegates Visit New York.

Delegates from the Russian Society for the Promotion of Technical Education visited the Forty-second Street office of the New York Edison Company on Thursday evening, August 7. They were shown through the model kitchen and laundry in the basement, the household appliances exhibited in the showrooms were explained and they visited the recently established Bureau of Electro-Therapeutics. One of the delegates, a physician, was especially interested in this branch of the company's work, and a number of the appliances, he said, were not in use in his country.

The members of the party were sent to this country to study educational methods. They have "done" New York, inspecting among other places, the Waterside station of the New York Edison Company.

Prominent Electrical Men Victims of Fatal Automobile Accident.

Louis E. Beilstein, former general manager of the Toledo Railways & Light Company, James P. Ross, of Cleveland, formerly connected with the Northern Ohio Traction Company, and Howard Davis, of Toledo, chauffeur for Mr. Beilstein, were killed; John F. Collins, of Jackson, Mich., vice-president of the Michigan Union Railroad, was fatally injured, and E. F. Wickwire, sales manager of the Ohio Brass Company, Mansfield, Ohio, was injured when Mr. Beilstein's automobile was overturned in a ditch at Wyandotte, Mich., on August 10. Mr. Wickwire made a most fortunate escape and was removed to the Toledo Hospital suffering from a broken ankle and a sprained back, where, at last reports, he was resting easily and well on the way to recovery.

Telegraph Service at the Gettysburg Peace Reunion.

Probably no occasion since the Spanish-American war interested so many people in the news of its events as the Peace Reunion and encampment of the veterans of the North and South on the fields of Gettysburg, which was celebrated recently. There were 141 newspaper men in camp, 100 of whom were using the wires of the Western Union Telegraph Company for press specials night and day. They came from as far as Seattle and Los Angeles, and from every city of any importance in the country. There was also a correspondent from the London *Times* who, on the night of July 4, filed nearly 1,000 words of cable press matter for his paper. The same night the operators sent 2,500 words to a Los Angeles paper, the operator sending it direct to Los Angeles with as much ease and facility as from one part of the city to another. The Western Union had a night and day force of 15 operators, and they handled the total of nearly 1,000,000 words, 163,000 words being sent in one day. In addition to this the company had installed a commercial office for general business.

Glasgow Exhibition of Electrical Devices.

Glasgow, Scotland, continues its efforts toward making the city bright and clean. A smoke-abatement exhibition was held there last year, at which all kinds of gas and electric appliances were displayed. The following English press announcement of an electrical exhibition to be held in Glasgow now appears:

The corporation of Glasgow has made definite arrangements for the exhibition of electrical appliances which is to be held in the city from October 23 until November 15, to bring before the public generally the advantages of electricity for many purposes. There will be shown appliances for domestic heating, stoves of all kinds, cooking and laundry appliances, water heaters, circulators and geysers, appliances for the generation, transmission, and utilization of power, elevators and hoists, fans and other ventilating apparatus, mechanism for preventing the emission of dust or grit from chimneys, shop-window lighting, and illustrations of the use of electricity for cinematograph purposes.

Three British exhibitions of this kind have been held within the past 10 years—two in London and one in Manchester—but this will be the first exhibition which has been arranged in Glasgow for the display of purely electrical appliances.

A Peculiar Fatality.

A peculiar fatality caused by contact with a highly charged electric wire occurred at Salisbury Beach, Mass., when a boy seized the string of a kite which he saw drifting and which had attached to it a strand of wire. The latter came in contact with an electric cable carrying 550 volts and the current was communicated to the boy's hand, causing burns which necessitated the amputation of the fingers. Lockjaw followed, resulting in the boy's death.

Huge Wireless Station on the Panama Canal.

One of the greatest naval radio stations in the world, even eclipsing in size the new station at Arlington, Va., is to be constructed by the United States at Caimito, in the Canal Zone. It will be known as the Darien Radio Station, and whereas only one of the Arlington towers reaches the height of 600 feet, all three of the towers at Darien will be that high. The Darien plant, it is expected, will be able to communicate with San Francisco, as well as with Arlington and to reach into the southern seas as far as Valdivia, Chile, 421 miles south of Valparaiso, on the west coast of South America, and as far as Buenos Aires, Argentine, on the east side. The Darien station will be used exclusively for Government business, principally as a relay station for communication with naval vessels in southern waters and the present wireless stations at Colon and Balboa will continue to handle messages for ships using the Canal.

Additions to Philadelphia Plant.

The Philadelphia Electric Company is planning to incerase its plant and power capacity to cope with the extensive demands made upon it by new business. A new substation to cost $200,000 is about to be built at Sixty-fifth Street and Passchall Avenue, to distribute power to plants in West Philadelphia and Chester and Delaware counties. A substation at Marcus Hook is to provide for the Viscose Company's silk manufactory at that place. Another new substation at Chester will furnish the power for the Chester Solid Steel Casting Company's rolling mill and other industrial plants. Besides these other improvements the Electric Company will enlarge materially its Christian Street plant, in which are to be placed two new turbogenerators, which will produce one 47,000 and the other 41,000 horsepower, altogether 88,000 horsepower. Negotiations between the Pennsylvania Railroad Company and the Philadelphia Electric Company have been resumed for the supply of power for the electrification of the road to Paoli.

Adam Gschwindt.

Few men have made such rapid advances in the electrical industry in so short a time as has Adam Gschwindt, vice-president and general manager of the Rockford (Ill.) Electric Company. Mr. Gschwindt was born in East Stroudsburg, Pa., and early in life entered the employ of the steel mills at Scranton. In 1903 he became connected with the steam-heating field as fireman for the Economy Light, Heat and Power Company. He advanced rapidly to the position of general superintendent and in 1907, when the Economy Company merged with the Scranton Electric Company, had built up the business of the former to such an extent that it became known as the largest steam-heating plant in the country, serving over 1,000 customers.

When in 1909 Mr. Gschwindt was called to the trusted and responsible position of purchasing agent by the American Gas & Electric Company, of New York, it was done by students of men—done after a complete review of his abilities, his attainments, and his results. Mr. Gschwindt made good. He was subsequently given the additional positions of engineer of the steam-heating department and editor of the company's monthly bulletin and in the latter capacity enthused, inspired and encouraged others to make good. Field men, engineers, office men, managers—men higher up and men who depend upon their experience and muscle, all felt the current of encouragement that was constantly radiated in the bulletin.

In June of 1913 Mr. Gschwindt was promoted to the position of vice-president and general manager of the Rockford Electric Company, which is controlled by the American Gas & Electric Company. Business men and private citizens in Rockford have found in Mr. Gschwindt a quiet, steady, reliable man—a man without show, pretense, or pomp—a thinker and a worker.

In a recent issue of the bulletin, Mr. Gschwindt, while he was still editor, unconsciously drew an outline of his own character when he wrote, "The man who wins today is the man that has the sunshine of success in his soul—the man that has the true ring of a result-getter—the tireless, always-willing-to-work chap—the man that syndicates sunlight, and sends the whole organization on to success."

Adam Gschwindt,
Vice-President and General Manager of the Rockford Electric Company.

Increasing Use of Electric Heating and Cooking at Shanghai, China.

The use of electricity for heating and cooking in the international settlement at Shanghai was introduced less than three years ago by the Electricity Department of the Shanghai Municipal Council, which is supplying the necessary outfits on hire at a small monthly rental of 0.50 tael (about 33 cents United States currency) for either cookers or radiators.

During 1912, according to the report of the electrical engineer, the radiators and cookers together connected to the mains represent a load of 293 kilowatts or 77 per cent over 1911, and brings the total connected to the mains up to 674 kilowatts. Heating and cooking outfits of both American and European manufacture are used.

While heating and cooking by electricity may be considered a luxury, the low rate charged by the electricity department for electricity for this purpose has made the cost very reasonable. The residential rate for electricity for lighting purposes is about six cents United States currency per kilowatt-hour, and for heating and cooking about one and two-thirds cents per kilowatt-hour.

The supply of electricity in the international settlement is on the alternating-current system at a frequency of 50 cycles per second, all lighting, heating, and cooking being done at 200 volts.

Government to Sell Lumber and Cedar Poles in State of Washington.

A sale of government timber involving 70,450,000 board feet and 286,000 linear feet of cedar poles on the Olympic National Forest, Washington, is about to be advertised.

Though all the timber will be sold to one bidder, it lies in two blocks, separated by an old burn, the result of a fire which consumed the timber on the intervening land. The first block is within the watershed of Little River, and is estimated to contain 16,060,000 board feet of Douglas fir, 1,780,000 feet of red cedar, 2,160,000 feet of western hemlock, and 100,000 linear feet of cedar poles. The minimum rates which will be accepted for this timber are $1.65 a thousand for Douglas fir, $2 a thousand for red cedar, and 50 cents for western hemlock. The cedar poles will be sold for not less than 0.75 cents a linear foot for poles under 45 feet in length, with not greater than a 10-inch top diameter; 1.25 cents a linear foot for red cedar poles 45 feet and over in length, with not greater than a 10-inch top diameter.

On the second block, which is in the watershed of Ennis and Lake Creeks, there are estimated to be 31,400,000 board feet of Douglas fir, 5,430,000 feet of red cedar, 13,400,000 of hemlock, 220,000 of amabilis fir, and 186,000 linear feet of red cedar poles. The prices here are a little higher than on the other block, and the minimum rates at which the timber will be advertised are: Douglas fir, $1.80 a thousand; red cedar, $2.50 a thousand; hemlock and amabilis fir, 50 cents a thousand. The rates for cedar poles are similar to those prescribed for the first block.

A period of five years will be allowed for the cutting and removal of the timber, subject to a readjustment in stumpage prices at the discretion of the forester in 1916.

The railway between the iron-ore mine at Gellivaara, Sweden, and the Norwegian port of Narvik is to be electrified to facilitate the heavy shipments of ore for export to Germany. In 1908 the amount of this ore shipped from Narvik was 1,300,000 tons and it is believed that the annual shipments will soon reach 3,500,000 tons.

Mr. Duffield Appointed Secretary of the National Electrical Contractors' Association.

George H. Duffield was appointed secretary of the National Electrical Contractors' Association on Tuesday, August 12, to succeed W. H. Morton, who resigned a few weeks ago, the appointment having been made at a meeting of the Executive Committee called at Utica, N. Y., to select Mr. Morton's successor. Mr. Duffield has been in the employ of the Association contintinuously during the last three years as its special representative. In this capacity he has traveled extensively visiting electrical contractors all over the country. There is probably no man in the association of which he now becomes the secretary who is personally known to so many of the members as is he, or who is more generally liked.

Mr. Duffield is a Pennsylvanian by birth. He is 28 years old, and is a graduate in engineering of one of the technical schools. Before becoming associated with the National Electrical Contractors' Association he was engaged in important engineering work, having at one time been on the staff of the J. G. White Companies.

It was the fact that he had made good in his former position with the Contractors' Association that led to his promotion to the secretaryship. Folks who know him believe he will do equally well in the new position. He will assume its duties on September 1.

Single-Phase Traction for Norfolk & Western Railway.

A decision has now been reached in regard to the system of electric traction to be adopted for the electrification of the Elkhorn Grade-Bluefield section of the Norfolk & Western Railway's main line. A recommendation to adopt the single-phase system was made by Gibbs & Hill, the consulting engineers of the company, after an exhaustive analysis of the various systems now in use both in this country and abroad. A careful study was also made of the local conditions involved, and comparisons were made of the capital and operating costs.

The intention is to use 25-cycle, single-phase current at a potential of 11,000 volts at the trolley. Energy will be supplied from a power house to be erected by the railway company at Bluestone, W. Va., with an installed capacity of 27,000 kilowatts. For transmission purposes the potential will be raised to 33,000 volts, and the transmission line will be carried mainly on the catenary bridges. Feeding points will be established at suitable locations along the line.

In view of the fact that freight trains only are to be handled, the locomotives, of which there will be 24, are to be equipped with motors of the induction type, and the control and connections are to be arranged to give three running speeds of approximately 7, 14 and 28 miles per hour, respectively. Special attention is being given to the question of regeneration and electric braking on grades, which would decrease the wear and tear on train equipment and also under favorable conditions tend to reduce the demand on the power house.

Chicago's Alternate Plans for City Owned Passenger Subways.

Mayor Harrison and the City Council, of Chicago, are preparing to submit to the voters at the annual municipal election in April, 1914, two ordinances for the construction of passenger subways in that city, of which the voters of the city will be asked to choose one.

The first ordinance provides for the construction of a limited system of passenger subways, in the downtown section, to be built by the municipality out of the profits it is now receiving from Chicago's surface street railways, and to be leased to the elevated railway companies as a downtown clearing house for elevated road traffic, being a substitute for the present overhead "Union Loop" system.

The second ordinance provides for the construction of a comprehensive city-wide system of passenger subways, to be built and operated independently of existing elevated or surface transportation lines, the construction capital to be furnished by a new financial syndicate that will be given exclusive subway operating rights for twenty years, at the end of which period the actual subways shall revert to the city free of all liens or debt, and the operating equipment purchased by the city or a new lessee.

New York Edison Company Outing.

The third annual outing and games of the New York Company Section of the National Electric Light Association will be held at Donnelly's Grove, College Point, Long Island, Saturday, September 6. A baseball game will be played during the afternoon by teams representing the Westchester Lighting Company and the Richmond Light & Railroad Company.

The athletic committee has arranged six events as follows: One-mile intercompany relay race, teams of four men each; one hundred yard dash, quarter-mile dash, half-mile run; 12-pound shot put; tug-of-war contest, teams of five men each.

Detroit Electrical Men Have Enjoyable Outing.

The Industrial Electrical Engineering Society of Detroit, Mich., had an outing on Saturday, August 2. There were about 150 members and friends present. Athletic events were carried on and handsome prizes awarded to the winners.

The Society was organized October 30, 1912, and the members are made up of the chief electricians and their assistants at the different electrical plants in Detroit. There are also various salesmen representing the different companies who are doing business with these industrial plants represented in the membership.

The officers of the society are F. Allison, chief electrician, Ford Motor Company, president; A. E. Roach, Edison Illuminating Company, vice-president; C. E. Wise, Detroit district manager, Cutter Electrical & Manufacturing Company, secretary; G. R. Clover, Detroit district manager, Cooper-Hewitt Electric Company, assistant secretary; J. G. Plasko, chief electrician, Parke Davis & Company, financial secretary; G. W. Krause, chief electrician, Packard Motor Car Company, treasurer.

Philadelphia to Have 1914 National Electric Light Convention.

At the meeting of the executive committee of the National Electric Light Association, held on July 23, it was decided to hold the next convention of the Association at Philadelphia. The last convention held by the Association in Philadelphia was in 1887.

Report on membership showed a net total of 12,676 members, this being the highest number yet reached by the Association. The report is as follows: Class A, 1,104; Class B, 10,430; Class C, 55; Class D, 243; Class E, 844.

Second-class mail privilege has been secured for the Bulletin of the Association, and this will be mailed to all members from January 1, on a subscription basis. A saving of about $3,000 a year is estimated.

Chicago Electric Club to Hold Picnic.

On August 21 the Electric Club of Chicago will hold a basket picnic at Northfield Grove, Shermerville, Ill. A train will leave Union station over the Chicago, Milwaukee & St. Paul Railroad at 12:40 p. m. and returning trains will leave the Grove at 6:50 and 10:26 p. m.

Numerous social and athletic events have been arranged for and excellent prizes will be awarded winners of the various contests. Entertainment features include games for men and women, bowling, tennis, dancing, races, etc.

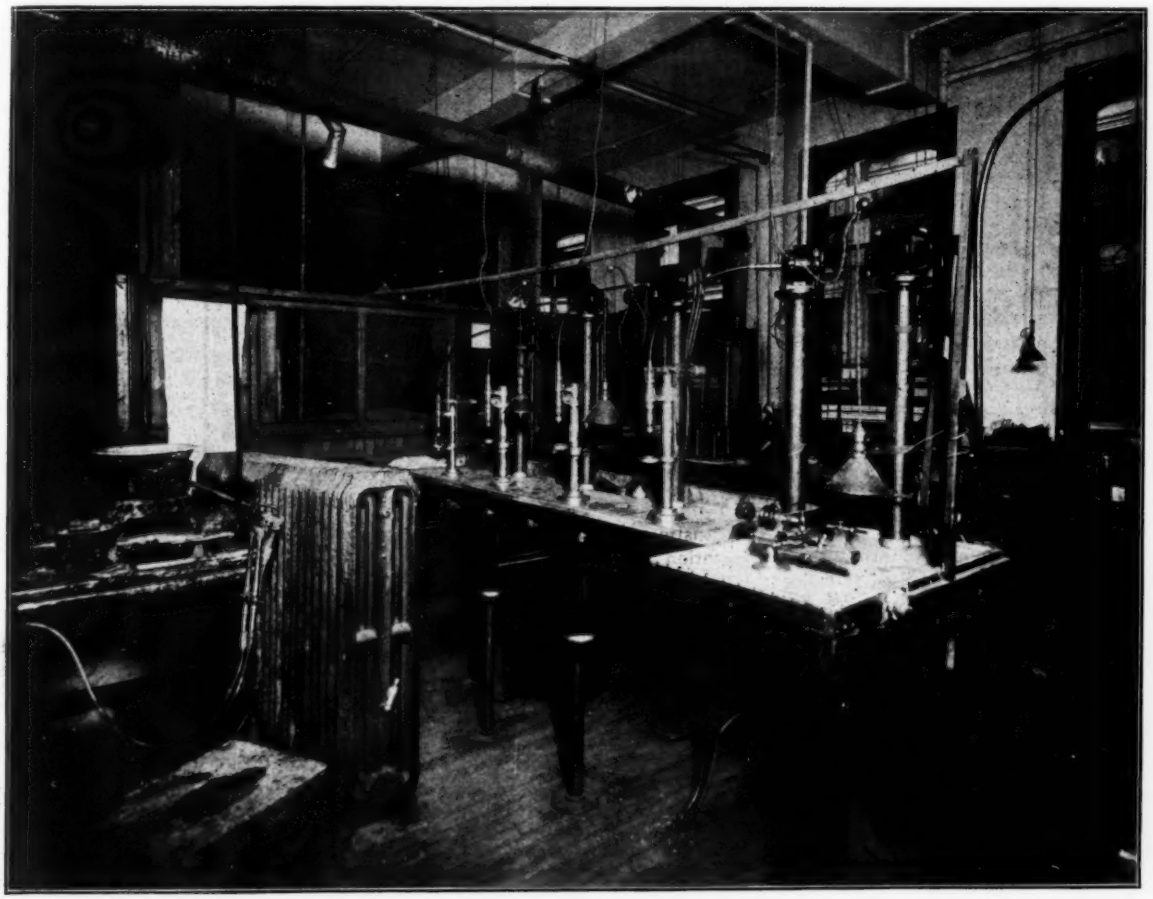
The distribution of tickets is in charge of O. B. Duncan, 423 N. Lincoln Street, to whom reservations should be made.

Electricity in Jewelry Manufacturing.

Increased production with the same personnel, tool equipment, floor space and working time and improved quality of product, due to uniform speed, are the two most important advantages of motor drive for jewelry manufacturing plants. This article gives a detailed analysis of operating costs in a typical converted plant and operating data on a number of installations using motor drive.

Motor drive in jewelry manufacturing plants has, for a number of years been so successfully employed, and the resultant benefits so widely appreciated that the following discussion is only intended to point out a few of the particularly salient points in connection with the adoption of this form of power.

One of the most important phases influencing the successful conduct of any manufacturing establishment is the amount of output obtainable with a given personnel, tool equipment, floor space and working time. Without increasing any of these factors, the substitution of mechanical drive by the installation of electric motors has variously augmented the productive capacity of different shops from 5 to 100 per cent. In other words, a greater amount of work is produced per operative machine per day, due to maintenance of speed under varying conditions of load; the ease by which the maximum cutting speed can be sustained throughout a given operation; the advantage gained by better arrangement of machines in regard to natural or artificial lighting facilities, as well as in the readier access to and sequence of material from the unfinished to the finished state; finally because the greater cleanliness, purer air and generally better hygienic surroundings of the motor-driven shop re-act favorably upon the health, cheerfulness and activity of the operatives.



Group of Drills Driven by Individual Motors in Jewelry Plant.

While increased production is obviously the most important result attained by the installation of electric drive, it is also true that direct economies are very frequently effected in the power costs. This was the case in a jewelry factory in the East, which, previous to the adoption of central-station service, operated a 50-horsepower isolated steam plant. After several unsuccessful attempts the central-station management obtained permission to make a detailed engineering investigation of the isolated-plant operating conditions and the results indicated that a substantial saving in power costs could be effected by the installation of electric motors and the use of central-station power.

The original equipment of this factory comprised a 50-horsepower slide-valve engine supplied with steam from a 90-horsepower horizontal return-tubular boiler. No traps were used in the steam piping which supplied various parts of the factory with heat. As is true of many plants operating under these conditions, considerable

annoyance was experienced, especially in the winter, at the slowing down of the rolling mill, polishing apparatus and steam-driven blower equipment, production being greatly diminished under mechanical driving. Since the installation of electric motors the production in these departments has been increased 13 per cent and in addition the uniform speed of the motor-driven machines has greatly improved the quality of the work.

Squirrel-cage induction motors, aggregating 32.75 horsepower, operating at 220 volts, three-phase, 60 cycles, were installed throughout, as follows:

One three-horsepower motor, 1,200 revolutions per minute, driving scratch-brushing and coloring equipment, including two direct-current plating dynamos; three scratch-brushing heads, and one 13-inch exhaust fan.

One 7.5-horsepower motor, 1,200 revolutions per minute, driving a polishing bench, six heads, equipped with a No. 4 blower.

One two-horsepower motor, 1,200 revolutions per minute, driving a duplex power pump located in the engine room.

One 7.5-horsepower motor, 1,200 revolutions per minute, driving a line shaft which operates three rolling mills.

One 0.5-horsepower motor, 1,800 revolutions per minute, belted to a line shaft driving two high-speed drills, and three small lathes.

One 0.25-horsepower motor, 1,200 revolutions per minute, driving a tub-cleaning machine.

One one-horsepower motor, 1,800 revolutions per minute, driving a double emery wheel, 10 inches in diameter.

One five-horsepower motor, 1,200 revolutions per minute, belted to a line shaft driving two drop hammers, 450 pounds and 300 pounds; two 200-pound and two 75-pound drop hammers; one power press, and one rotary shear.

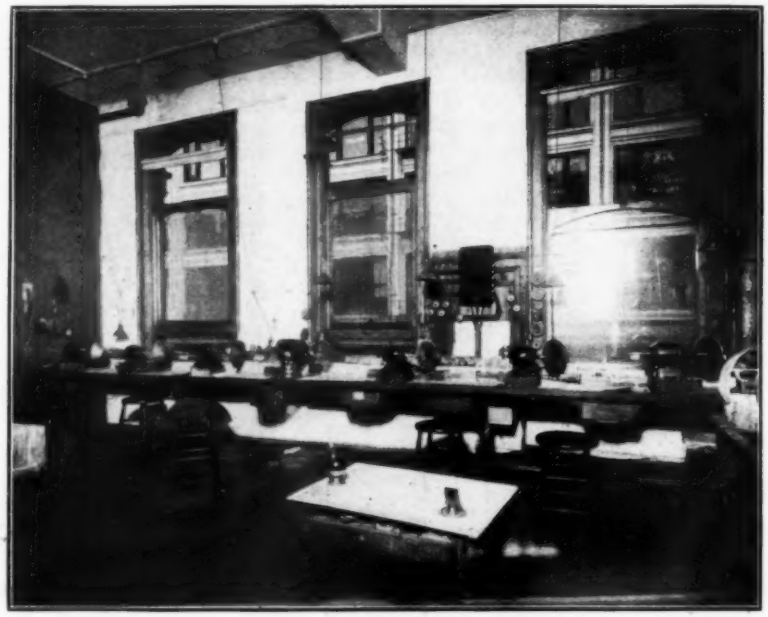
One two-horsepower motor, 1,800 revolutions per minute, driving a machine-shop equipment comprising two engine lathes; one shaper; one emery wheel; one cut-off saw; one grindstone, and one milling machine.

One two-horsepower motor, 1,800 revolutions per minute, belted to a line shaft driving four power presses and six high-speed lathes.

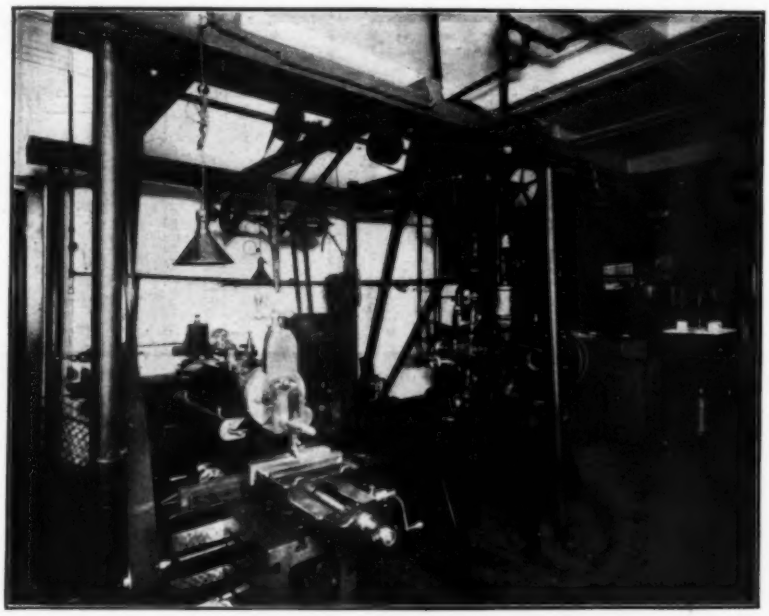
One two-horsepower motor, 1,800 revolutions per minute, driving a No. 3 American gas-furnace blower.

The estimated cost of electric energy for this factory was $66 per month, based upon a 10-hour day and service used 300 days per year. The average monthly consumption of energy was 2,200 kilowatt-hours, the average rate being three cents per kilowatt-hour. In soliciting the business of this factory, the fact that central-station power would be available at all times was emphasized; also it was pointed out that a licensed engineer or fireman would not be needed so long as the steam pressure was kept below 15 pounds per square inch, since steam was not to be used for developing mechanical power. In this case it was simply necessary to equip the boiler with a sealed safety valve set at 15 pounds per square inch to eliminate the services of an employee receiving $150 per month.

The total cost of operation, as estimated by the central-station company, excluding fixed charges, was $1,444.50, the items being as follows: electric energy, $792; coal for heating, 59 tons at $4.50, $265.50; coal for commercial uses, $207; attendance, one quarter of the time of one man at $60 per month, inspecting motors, firing boiler, etc., $180; total $1,444.50. As a matter of fact this estimate was high, the cost of operation averaging less than $1,444.50. The management of the factory is highly pleased with the economies being effected and with the



Group of Polishing Motors.



Three-Horsepower Motor Driving Small Group of Machines.

Jewelery Manufacturing Data.

The term load-factor is used in these data in such a sense that a load-factor of 100 per cent represents the use for 24 hours every day of power corresponding to the rated capacity of the motors connected. An operating-time load-factor of 100 per cent represents the use of the rated capacity of the motors for the running hours per day specified for each installation.

Jewelry manufacturing plant operating 10 hours per day.

Total connected horsepower, 32.75. Total number of motors installed, 11. Average kilowatt-hours per month, 2,200.

Kilowatt-hour consumption for 12 months; January, 2,400; February, 1,600; March, 1,410; April, 1,600; May, 1,900; June, 1,670; July, 2,310; August, 2,390; September, 2,460; October, 2,560; November, 2,650; December, 2,540.

Load-factor, 12 per cent; operating time load-factor, 25.8 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts. Squirrel-cage motors are used.

No.	Horse-power.	Speed R. P. M.	Application.
1	2	1,800	Belted direct to a No. 3 American gas-furnace blower.
1	2	1,800	Belted to a line shaft driving four power presses; and six high-speed lathes.
1	2	1,800	Belted to line shafting driving two engine lathes; one shaper; one emery wheel; one cut-off saw; one grindstone; and one milling machine.
1	5	1,200	Belted to a line shaft driving two drop hammers, 450 pound and 300 pound; two 200-pound hammers; one 75-pound hammer; one power press; and one rotary shear.
1	1	1,800	Belted direct to one 10-inch double emery wheel.
1	0.25	1,200	Belted direct to one tub-cleaning machine.
1	0.5	1,800	Belted direct to a line shaft driving two high-speed drills; and three jeweler's lathes.
1	7.5	1,200	Belted to a line shaft driving three rolling mills.
1	2	1,200	Direct-connected to duplex pump.
1	7.5	1,200	Belted direct to polishing bench, No. 4 blower, six heads.
1	3	1,200	Belted to line shaft driving two direct-current plating dynamos; three scratch-brushing heads; and one 13-inch exhaust fan.

Jewelry factory operating 10 hours per day.

Total connected horsepower, 9.75. Total number of motors installed, 25. Average kilowatt-hours per month, 423.

Kilowatt-hour consumption for 12 months: August, 466; September, 410; October, 600; November, 600; December, 732; January, 530; February, 571; March, 576; April, 650; May, 465; June, 240; July, 204.

Load-factor, 7.8 per cent; operating-time load-factor, 17 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is 220 volts, direct current.

No.	Horse-power.	Speed R. P. M.	Application.
1	1	1,200	Direct-connected to blower.
1	0.25	1,150	Belted to countershaft driving small hack saw; and 10-inch emery wheel.
8	0.125	1,400	Polishing motors.
1	0.25	1,500	Direct-connected to metal laps.
1	1	1,200	Belted direct to pressure blower.
1	1	500	Direct-connected to wire roller.
1	1	500	Geared direct to flat rolls.
1	2	1,750	Belted direct to vacuum pump.
1	1	1,120	Belted to a line shaft driving one lathe; one shaper; and one routing machine.
8	0.125	1,200	Each direct-connected to a small drill press.
1	0.25	1,150	Geared direct to jeweler's lathe.

Jewelry factory located in Newark N. J.

Total connected horsepower, 22.5. Total number of motors installed, 4. Average kilowatt-hours per month, 2,050.

Kilowatt-hour consumption for 12 months: November, 2,666; December, 2,939; January, 1,938; February, 1,895; March, 2,167; April, 1,914; May, 1,929; June, 1,775; July, 1,118; August, 2125; September, 2,016; October, 2,180.

Load factor, 16 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is 500 volts direct current.

No.	Horse-power.	Speed R. P. M.	Application.
1	5	1,120	Belted to line shaft driving small drill presses; plating dynamos; and jeweler's lathes.
1	7.5	1,200	Belted to line shaft driving machine-shop equipment.
1	5	1,400	Belted to shafting driving polishing wheels, emery wheels, and blower.
1	5	1,200	Belted to two drop hammers; two rolling mills; and two rotary shears.

numerous advantages of electric drive that have an important bearing on reduced costs although not capitalized in the above estimate.

The total cost of equipping the factory for motor drive was only $920, divided as follows: motors, complete, $668; wiring, fittings, switches, etc., $160; pulleys, belting, shafting, hangers, $80; drying boxes connected to vats, piping and labor, $12; total $920.

In this factory, as in many others where isolated plants are to be converted, the question of heating was an important factor. The heating hours were as follows: January, 419; February, 378; March, 334; April, 279; May, 170; September, 170; October, 287; November, 323, and December, 419, making a total of 2,779. The condensing factor of radiation was taken as 0.35 or 0.35 pound of steam per hour for every 100 square feet of radiation, giving a total of about 385 pounds of steam condensed per hour. On this basis it was found that about 59 long tons of coal were required for the heating season of nine months.

Considerable steam is also required for commercial purposes, the requirements of the entire plant being summarized as follows:

Coloring room	347,400 pounds.
Vat in sink	6,192 pounds.
Steam acid blower	206,400 pounds.
Pickling vat, (first floor)	86,850 pounds.
Vats in sinks (first floor)	86,850 pounds.
Sinks (second floor)	86,850 pounds.
Total	820,542 pounds.

On the basis of an evaporation of eight pounds of water per pound of coal, there would be required for this work a yearly fuel consumption of 102,567 pounds of coal, or 46 tons of 2,240 pounds each.

In determining on the motor outfit for operating tools in a jewelry plant, one of the most difficult questions to decide is that of group or individual driving, and the most general solution is the combination of these two methods. The ideal method, and the one coming more and more into general use is to have the motor form an integral part of the machine. This method entirely eliminates belting and shafting, both main line and jack shafts. The saving in the cost of these mechanical transmission parts partially compensates for the installation of motor and controller.

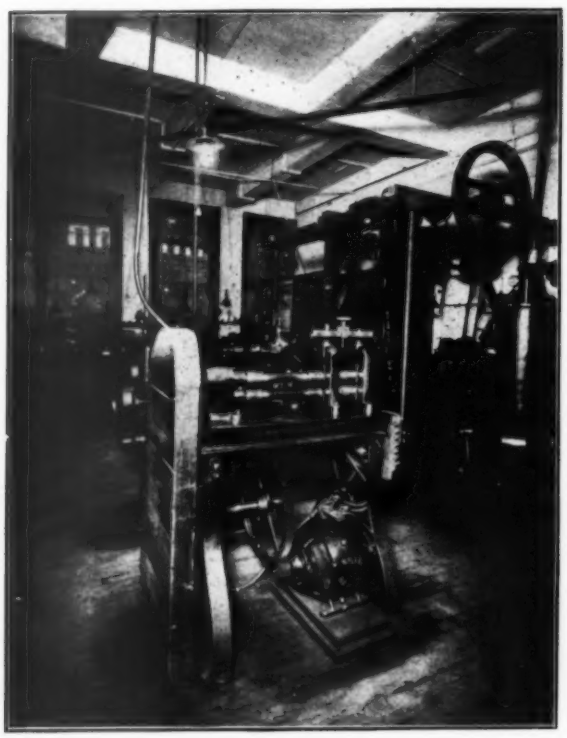
The slip of belts introduces an uncertain factor in power supply which is entirely absent with individual motor drive. Furthermore, with individual motor drive the power delivered to the driven machine is automatically controlled and, in case of heavy demands, may greatly exceed the rated power of the motor, even for considerable periods of time. Thus a motor-driven machine is always capable of maximum production, while with belt drive and poorly adjusted belts the machine frequently balks before its full capacity is reached.

The even and easily manipulated speed control of machines individually motor driven increases their productive capacity to a very material extent.

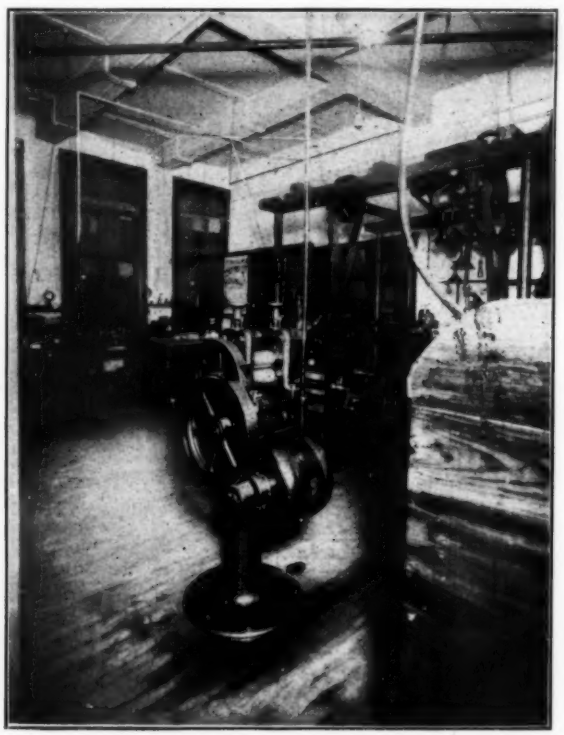
The most important advantage to be gained is a speed regulation adapted to the work. The convenience of securing the desired speed for maximum cutting, when electric drive is used, will result in a material increase in output. On most of the belt-driven tools the average increase of speed per step is about 50 per cent.

In every shop the labor item is the largest single item of expense, and the saving of a small per cent of a man's time will amount to quite an item at the end of a year.

Electric drive gives steady power and permits great ease of speed regulation. The controller can be placed at the most convenient point, or, if advisable, two or more handles can be provided at different points, one being arranged to travel with the tool carriage. With the belt-driven machine more or less time is always lost in throwing a belt, and a negligent operator will not always take advantage of a change of speed on account of the exertion required to make the change.



Roth Motor Driving Rolls.



Motor-Driven Wire Roller.

Economy in Billing.

The Louisville Gas & Electric Company has found a way to pay the interest on over $100,000 a year by the simple device of sending gas and electric bills to its customers on a single card. Heretofore separate cards have been used by the various companies making up the new corporation.

Commercial Practice
Management, Rates, New Business

White Way in Fall River.

The street lighting system of Fall River, Mass., has been increased and improved by the installation of 96 four-ampere magnetite lamps along the principal business streets of the city, in place of the older type of arc lamps. The initial illumination of the "great white way" occurred on the evening of August 6, and was celebrated with a banquet and a parade.

The enterprise was brought about through the efforts of the Merchants' Association in securing the co-operation of merchants whose stores and offices abutted the streets provided with the improved service. About $12,000 was subscribed by leading business men to pay the cost of the installation. The city and the Merchants' Association share the cost of current for 76 of the lamps which burn until midnight, in the proportion of 66.66 per cent to 33.33 per cent, the cost per lamp being 24 cents per night.

There are also 20 lamps, principally on street corners, which burn all night, for which the city pays 30 cents per lamp per night. (The cost of current supplied heretofore had been 22 cents per lamp per night.) According to the mayor, the added cost to the city of the new installation will be only 5 cents on $1,000 of taxable property.

The electricity is furnished by the Fall River Electric Light Company, which will supply current for the new lamps free of charge during the remainder of the month of August.

A novel feature of the banquet was the illumination of the hall by means of more than 150 miniature lamps of the same model as those on the streets.

The city council committee on lighting of the neighboring city of New Bedford attended the opening and, impelled by Fall River enterprise, have decided on a substantial increase in the street lighting service in their city.

Reduction in Lamp Prices.

The Edison Electric Illuminating Company of Boston announces that beginning August 1, customers who are entitled to free renewals or first installations of carbon incandescent lamps will be provided with Mazda (tungsten) lamps at the following reduced rates:

Size.	Old Price.	New Price.
15 watts	$0.25	$0.25
25 watts	0.25	0.18
40 watts	0.25	0.16
60 watts	0.35	0.14

Sizes from 100 to 500 watts inclusive are furnished free, former prices having been from 40 cents for the 100-watt size to $2.00 for the 500-watt.

Large Power Contract Closed in Minneapolis.

The Minneapolis General Electric Company has closed a contract with the Twin City Trading Company covering 2,000 horsepower in motors. The present installation will be only 500 horsepower, but new elevators which will be constructed within a year will require an additional 1,200 or 1,500 horsepower.

A SOLICITOR'S POCKET BOOK.

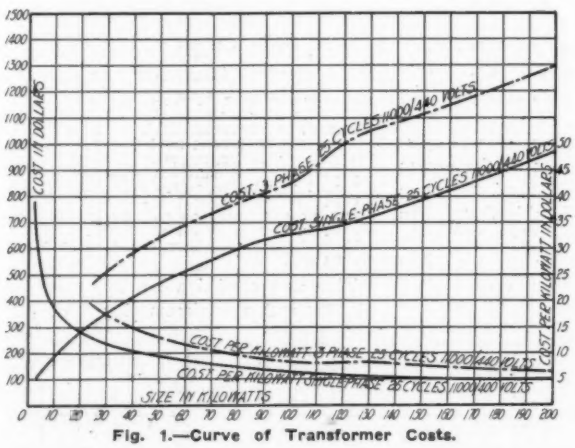
By V. S. Beck.

The writer is led to give this description of a solicitor's handbook, constructed by himself, through seeing the great lack of such a thing among the engineers with whom he comes in contact. A large part of such a condensed compendium of information must necessarily be made up of curves to save space. And it is this curve habit we should all develop.

The experience the writer has had in developing curves showing the relations of functions with one or more variables when the variables have assumed different values, has helped him to see the great value of so notating one's data and information.

Why it is, that for quoting approximate figures or making rough estimates, more use is not made of plotted curves is a mystery. It is a common trait of all of us that we are like the man from Missouri and must be shown. And as it would seem strange if anyone could be found who finds data in mere tabulated form to so clearly convey to his mind the information there given, as could be secured by a line or curve picture, more use could be profitably made of such pictures.

However, there are some subjects which have been pretty thoroughly covered in curve drawings. Probably the performance of electrical machinery is one of the best examples. And it is likely from the great familiarity with these curves that most of us could very


COST IN DOLLARS
SIZE IN KILOWATTS
COST, 3 PHASE 25 CYCLES 1000/1400 VOLTS
COST SINGLE-PHASE 25 CYCLES 1000/1400 VOLTS
COST PER KILOWATT 3 PHASE 25 CYCLES 1000/1400 VOLTS
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COST PER KILOWATT IN DOLLARS

Fig. 1.—Curve of Transformer Costs.

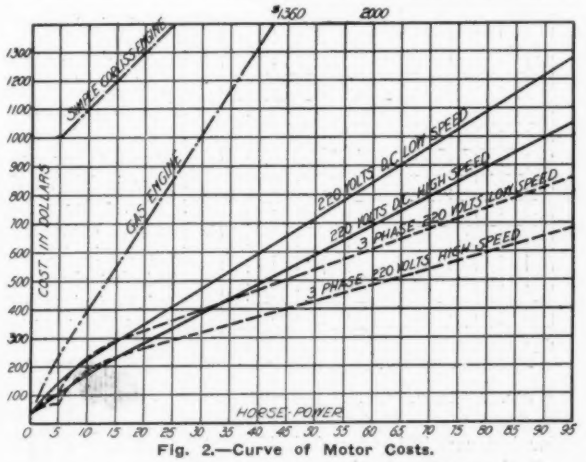


Fig. 2.—Curve of Motor Costs.

nearly draw the curves for power- factor, load, efficiency, etc. of a motor, nearly enough to show the approximate characteristics without seeing the actual test or data. There is no reason why these mental pictures should not be formed of a great deal of the information needed every day.

Nearly all curves needed by a power solicitor, for instance, could be properly classified under four heads, namely; costs of equipment; performance; costs of operation and general information, and it will be such curves of value to a power solicitor that will be shown.

The first subject, costs of equipment, is a very important one and the most necessary information can be very handily represented by a few curves similar to the ones shown.

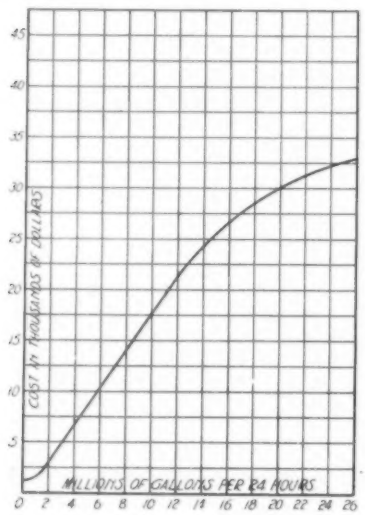


Fig. 3.—Curve of Pump Costs.

For instance, it is very desirable that at all times an approximate figure for a transformer installation can be given. Therefore, by using the curve in Fig. 1, a very close and rapid estimate can be made and the relative price of two or three single and one three-phase transformers can be seen. If it is desired, another curve can be drawn on the same sheet showing the weights for various sizes by merely putting another scale for weights alongside the cost scale.

The next cost curves, those of motors and engines are shown in Fig. 2. This set shows costs of various types of motors, and of gas and steam engines in moderate sizes. In the case of motors, the cost of rheostats is included with direct-current motors; starting boxes with single-phase motors; and compensators with three-phase motors over five-horsepower size.

Fig. 3 shows the cost of centrifugal pumps. In places where figures on pumping are frequently required, this is a very desirable curve. The cost of the motor is included in this curve.

For performance curves, it is best to secure the curves of a representative manufacturer and incorporate them in the set.

Inasmuch as exhaust fans are used in

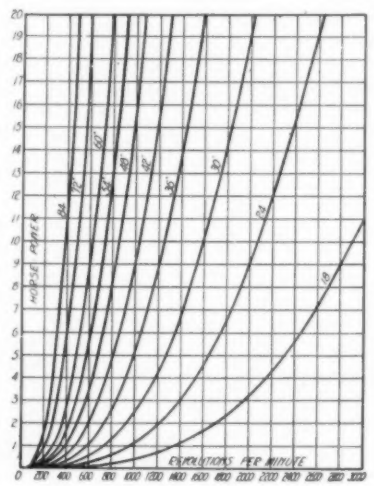


Fig. 4.—Curves of Fan Costs.

so great a number of installations, it would be desirable to have the curves of an average exhaust fan, shown in Fig. 4.

Every power man has occasion to specify some illumination so that the curves in Fig. 5 for a given kind of glassware are very convenient. In this figure, $I =$ intensity in foot-candles. It will be noticed that there are three types of lines used to designate the three combinations of walls and ceilings.

and retail and wholesale power schedules are shown.

These rate curves are developed from rates in effect in various parts of the

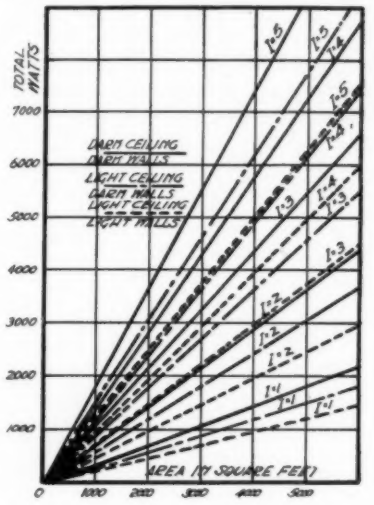


Fig. 5.—Illumination Curves.

country. The wholesale alternating-current power rate is as follows:

1.2 cents per horsepower-hour up to 20 per cent load-factor.
1.1 cents per horsepower-hour from 20 per cent to 30 per cent load-factor.
1 cent per horsepower-hour from 30 per cent to 40 per cent load-factor.
0.9 cent per horsepower-hour from 40 per cent to 50 per cent load-factor.
0.82 cent per horsepower-hour from 50 per cent to 60 per cent load-factor.
0.75 cent per horsepower-hour from 60 per cent and over.

This also carried a monthly minimum of $200 and a minimum charge of $2.00

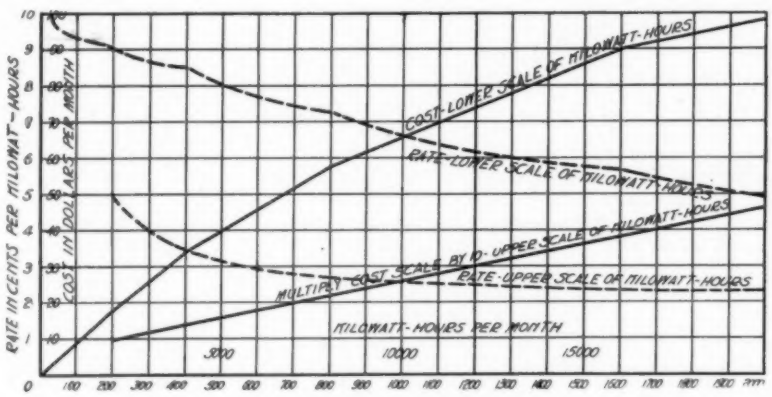


Fig. 6.—Retail Lighting Rate Curves.

In addition to the above, there may be sections of the country where there are in use a great many hoists or other types of machines and where it would be desirable to include the cost or performance of these machines.

The most used of the four classes of curves is the cost-of-operation curves. For this reason a curve of each type of rate used by the electric company should be carried.

In Figs. 6, 7 and 8, lighting schedules

per horsepower for each horsepower in excess of 100.

The curves on cost of equipment are special costs and must be secured for each place and company.

From Fig. 6, the average rate per kilowatt-hour and the total monthly bill can be read off directly for any consumption from one to 20,000 kilowatt-hours. In order to find the rate from one to 20,000 kilowatt-hours, read the lower scale of kilowatt-hours. Above 2,000 read the up-

per scale of kilowatt-hours. Thus the rate for 1500 kilowatt-hours is 5.73 cents while for 15,000 kilowatt-hours is 2.36 cents. The monthly bill for 1500 kilowatt-hours is $86.00 and for 15,000 is $360.00. The schedule of lighting rates in this case is as follows:

LIGHTING RATES.

First 25 kilowatt-hours per month 10 cents per kilowatt-hour.
Next 150 kilowatt-hours per month 9 cents per kilowatt-hour
Next 225 kilowatt-hours per month 8 cents per kilowatt-hour.
Next 400 kilowatt-hours per month 6 cents per kilowatt-hour.
All excess kilowatt-hours per month 2 cents per kilowatt-hour.
Next 800 kilowatt-hours per month 4 cents per kilowatt-hour.
$12 per year minimum charge.

All excess kilowatt-hours per-horsepower per month.....1 cent
Minimum charge: first horsepower, $1.00 per month. Excess horsepower, $0.75 per month

Fig. 8 illustrates a wholesale power schedule, showing average rates per kilowatt-hour and the cost per month for various size installations. The consumption for a 100-horsepower motor is also shown.

By having these sheets of curves photographed to a convenient size such as the standard card file size, 3 by 5 inches and putting them in a loose-leaf note book with other data, they become almost indispensible.

The writer uses an "I P" loose-leaf note book, 3 by 5 inches, opening at the end. In this are arranged curves of costs of electrical operation for various sizes of installation and various conditions of operation. These include a sheet for lighting, one for retail power and one for wholesale power. Next in order comes a series of curves showing cost of motors and engines, centrifugal pumps, and superimposed on the same curve sheets, but in different colors are shown the performance of motors, pumps, etc.

Following this is the performance curves of exhaust fans, next a chart for rapidly determining the monthly kilowatt-hour consumption for all sizes of installations from one horsepower to 5,000 horsepower for all load-factors. Following this is a curve showing the kilowatt-hours per ton of coal for various effeciencies of steam plant.

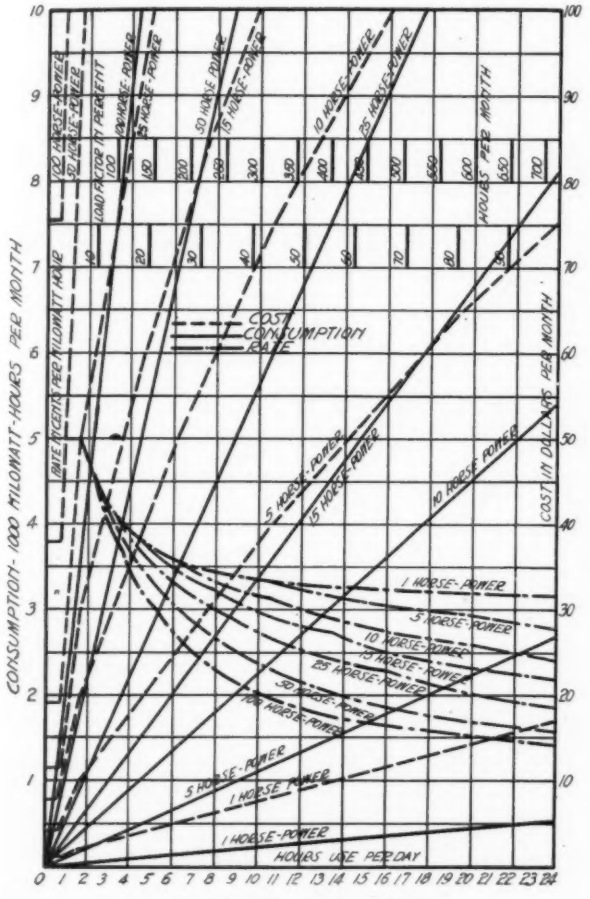


Fig. 7.—Retail Power Rate Curves.

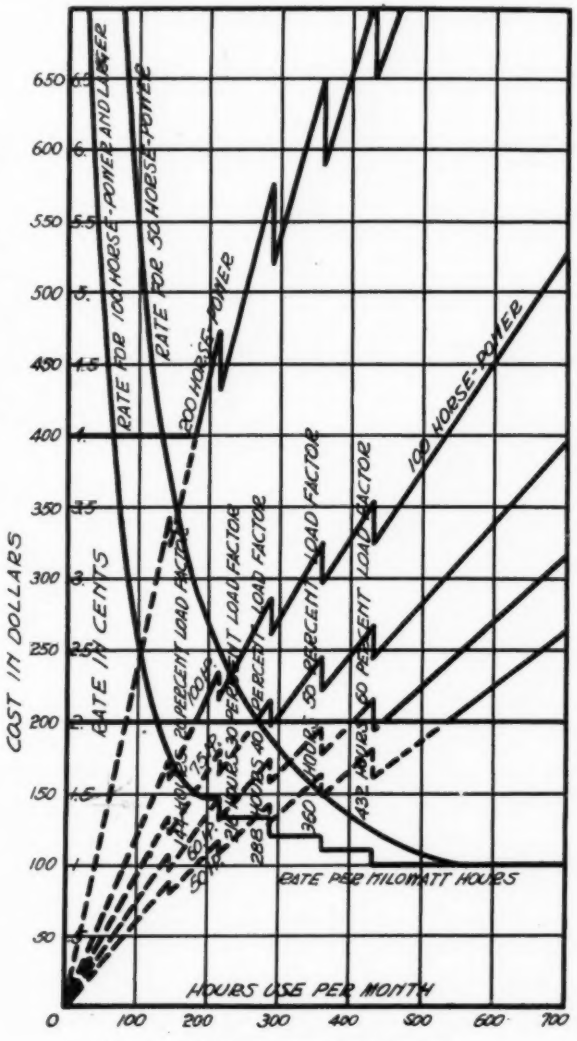


Fig. 8.—Wholesale Power Rate Curves.

In Fig. 7 is shown a retail power rate for various sizes of motors and the hours used per day. The curved dot and dash line show the rate per kilowatt-hour, the dash line shows the cost per month in dollars and the solid lines show the monthly kilowatt-hour consumption. The rate in this case is as follows:

RETAIL POWER RATE.

First 40 kilowatt-hours per horse-power per month.....5 cents
Next 1,000 kilowatt-hours per horsepower per month.....3 cents
Next 1,000 kilowatt-hours per horsepower per month.....2.5 cents
Next 1,000 kilowatt-hours per horsepower per month.....2 cents
Next 4,000 kilowatt-hours per horsepower per month.....1.5 cents

Next comes a tabulation of prices of transformers and motors, then a table showing the horsepower of engines of varoius sizes for all cut-offs. Then follow curves for short transmission-line designs.

Following these are tables, etc., almost 'ad infinitum.' They comprise wire tables, special contract clauses, logarithm tables, tables of areas, lamps and fan prices, costs of house and commercial wiring and a great multitude of facts and figures in every-day demand by an engineer.

On the backs of all curve sheets are typewritten equations and other informa-

tion corelated to the information given in the curves.

With this small pocket book it is possible for a power man to be equiped at all times to talk intelligently concerning most any proposition which may come up. And by using a small book of this size, one acquires the habit of carrying it at all times, whereas, a larger one would be left at the office.

A few sheets of plain paper should always be included for making notes. It is also possible to have a book binder put a pocket in one of the backs to be used as a card and bill case.

A great advantage of using the 3 by 5-inch size book is that the publication "Data" and a great many of the small books of information published by manufacturers are this size and hence the desirable sheets can be directly transferred.

Meter Testing in a Small Town.

At a conference of the meter Committee of the Ohio Electric Light Association held last winter a paper was read by C. B. Stelle outlining a suitable practice for companies having less than 500 meters. From this paper the following is taken, and it will be found suitable for instituting meter testing where this has not previously been done.

An important factor in meter testing is the test meter on standard, with a convenient and quick way of checking its accuracy. Rotating standards with a range suitable for nearly all meters met with in practice can be obtained from the leading electric companies for about $65.00. Its accuracy can be checked and maintained by taking the average accuracy of a lot of new meters, not including any one that might differ a few per cent from the others, or by maintaining what is known as a "wall standard." This consists of an ordinary meter of suitable capacity, the accuracy of which was nearest to the average of the lot of new meters tested, fastened in some suitable place and used only to check the rotating standard once a week, or oftener if the standard has been subjected to abuse, or its accuracy is doubted by the tester.

An equally important item is the tester. Take the young man who has had a fair education, the one who is building an induction coil or motor; the one who is more interested in the electrical journals than the daily papers and periodicals, even though he did shut down the whole plant on a Saturday evening by trying to electrocute a rat—he is the man to take. If there is no one around the plant who is familiar with ordinary methods of testing to instruct him, it might be advisable to send him for a month or two to one of the larger companies to act as an assistant, and thereby learn to test meters. Then let him test what meters there are in the place usually set aside for this purpose until you are satisfied that he is familiar with the necessary adjustments and is competent to test any meters he may find on the line; even then it would be advisable for him to test the smaller-capacity meters first and gradually work up to the larger ones.

He will require, of course, besides the standard, a set of meter-adjustment tools, as well as a small bank of lamps for a load; later on get him a meter-testing rheostat to take the place of the lamp bank.

It is not expected that he will go through the routine advocated by the larger companies at first, but will acquire that gradually. There are, however, a few rules that he should abide by from the start, which from the experience of other companies are most important.

Notify the customer or person in charge that he is about to test the meter.

He should be polite and of good appearance, showing little or no interest in anything but the meter.

Approach the meter as quickly, carefully and quietly as possible.

Ascertain if the current is on first,—in small towns, the linemen may have that side of the town cut off for some foolish reason.

Enter the data such as: company number, maker's number, reading, size and type of meter, etc. on suitable card While getting this data it is well to see if the meter is sealed, and if there is any movement of the meter due to creeping; if so, the time of one revolution should be taken, of if the creep is very small, a quarter or half revolution, and the corresponding watts calculated. If it is due to a bell-ringing transformer, or a light burning in some part of the house, the meter should be jumped so as not to unnecessarily inconvenience the customer.

Wipe dust and dirt carefully from the cover before removing.

As there are two adjustments for correctly altering the meter's accuracy, a test on both of these conditions is necessary, namely light and full load. The light-load condition should be taken first as the meter might not start on light load, and a full load at first might remove the cause of meter not running on light load.

The light load consists of one lamp, either an 8 or 16-candlepower lamp, depending on size of meter; usually an 8-candlepower lamp for ordinary house meters.

The number of revolutions for the house meter usually taken for light loads is two, and for full loads, twenty. Less that this may introduce errors in observation, while more is unnecessary.

By multiplying the watt-hour or testing constant by the number of revolutions, we have the watt-hours that the meter records. Also multiplying the watt-hour or testing constant by the number and fraction of revolutions the standard makes, we have the watt-hour that the standard records. Dividing the meter watt-hours thus found by the standard watt-hours, and multiplying by 100, gives the present accuracy of the meter tested.

The same procedure is followed for full load, and the result retabulated on the "As found" section of the card.

Should the test "As found" prove the meter out of calibration more than two per cent plus or minus, i. e., if the registration is below 98 per cent or above 102 per cent, the meter should be adjusted first on full load, for the full load affects both light and full-load conditions, and finally on light load, the condition of the meter being tabulated on the "As left" portion of the card.

About this time the consumer will appear on the scene with an exclamation of "How is she?" This is the most critical part of the test, for if you say it is slow, you will probably be subjected to a torrent of abuse. If you say "it's fast" he will get to the office before you do, and things will be mighty uncomfortable for everybody for awhile.

The best and common practice is to tell him that you are instructed not to give out any information, and refer him to the proper party in the office.

After reconnecting meter, check readings and replace cover carefully (after cleaning dial glass) and seal meter. Try at least one light in circuit to see that you have not left same open.

Gather up all your apparatus carefully, for it is burdensome for the consumer to let you go up to the meter again for those pliers you forgot. On the way out notify the person in charge that you are through, thank him for some imaginary kindness like showing you to the meter, and wish him a good morning. It doesn't cost anything to be polite, but it paves the way to your success as meter tester; then go on to the next test.

All records of tests should be carefully filed and at certain intervals, say monthly, should be tabulated according to type of meter, with the number and per cent of total meters of each type tested and subdivided as follows: maker, type, light load, full load, number and per cent above 120, 110 to 120, 105 to 110, 102 to 105, those correct or between 98 and 102 underscored, 95 to 98, 90 to 95, 80 to 90, below 80, not running, total, maximum, minimum, average.

Two electrically driven pumps have been installed in the water works of Biloxi, Miss. Each has a capacity of 750 gallons per minute and is driven by a 75-horsepower motor.

Electrical Construction

INSTALLING A 12,000-AMPERE SWITCHBOARD IN AN ISOLATED PLANT.

Some Details of Design and Construction.

It is sometimes thought that direct-current switchboards are so simple and so well standardized that nothing of interest remains to be said of them. Nevertheless, there are many men engaged in electrical construction, and doing switchboard work, who can not set up even the simplest type of direct-current board and make a really highclass job of it. Of course the electrical connections on the ordinary board of the class mentioned are easy enough to understand; almost any man who is any sort of an electrician at all can connect the board up so that the plant can be run. But the problem of securing the greatest flexibility and convenience of control, neatness, and stability, and of avoiding needless waste of expensive materials is by no means always an easy one. In fact, there are rather few electricians that cannot profit by the study of really good installations of direct-current boards. The following notes undertake a brief description of what is considered such an installation. The installation in question was put in by Henry Newgard & Company, of Chicago, in a large industrial establishment in the city mentioned. This article will pay special attention to the methods employed in handling mechanical details in the erection of this very large switchboard.

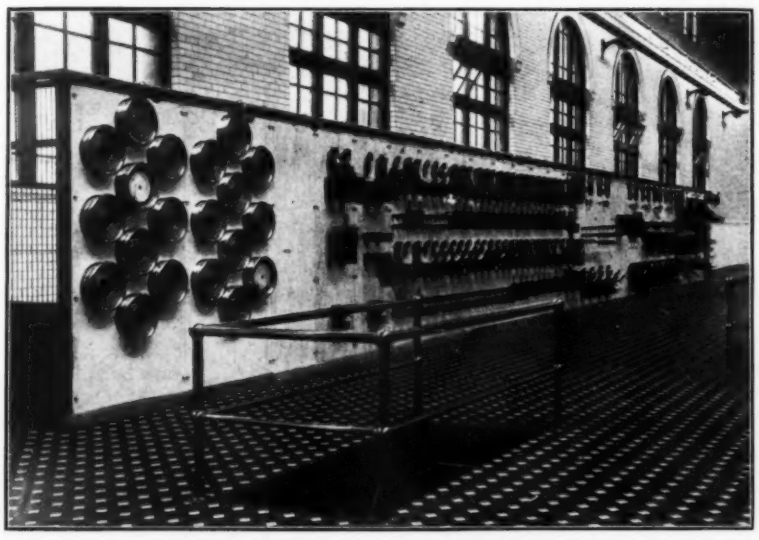


Fig. 1.—Front View of Switchboard.

The board is 77 feet and 6 inches in length. Its estimated weight is 27 tons. The generator panels are in the center. To these are connected six 220-volt, two-wire direct-current generators. Three of these have a rated output of 750 kilowatts each, while the capacities of the other three are 500, 100, and 50 kilowatts, respectively. The load on the plant now sometimes reaches a maximum of 12,000 amperes.

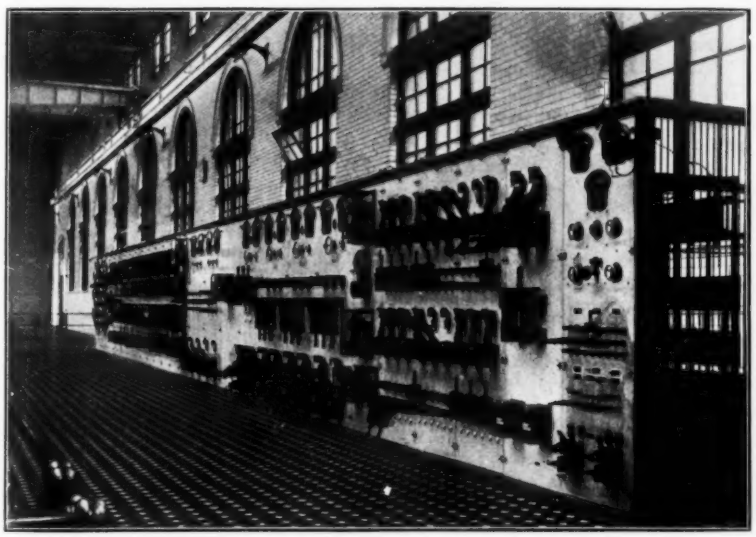


Fig. 2.—View of Switchboard From Opposite End.

In the building of this switchboard use had to be made of an old board that had been in service in the plant for several years. Every piece of apparatus was removed from this, given any necessary repairs, and refinished. All the marble in the old board was carefully repolished. The present installation consists of 25 panels, all of white Italian marble. The base is of gray marble, while the board is finished at the top with molding of marble of the same grade as that of the panels. The appearance of the front of the board is brought out rather well in Figs. 1 and 2. As has been noted already, the generator panels are in the center; on either side of these are feeder panels; at the left end there are panels on which steam gauges, water-pressure gauges, etc., are mounted, and at the opposite end there is a panel employed for the control of batteries used in certain signal work around the factory.

Electrical Connections.

While the arrangement of the circuits on the back of this switchboard are comparatively simple, there are certain things about it that are well worth noting. Reference should be made here to Fig. 3,

where the connections of the two smallerof one or both of the two small generaand one of the larger dynamos are shown tors, the 24-hour circuits are connected diagrammatically. The other three gen- to these machines. When the two-pole

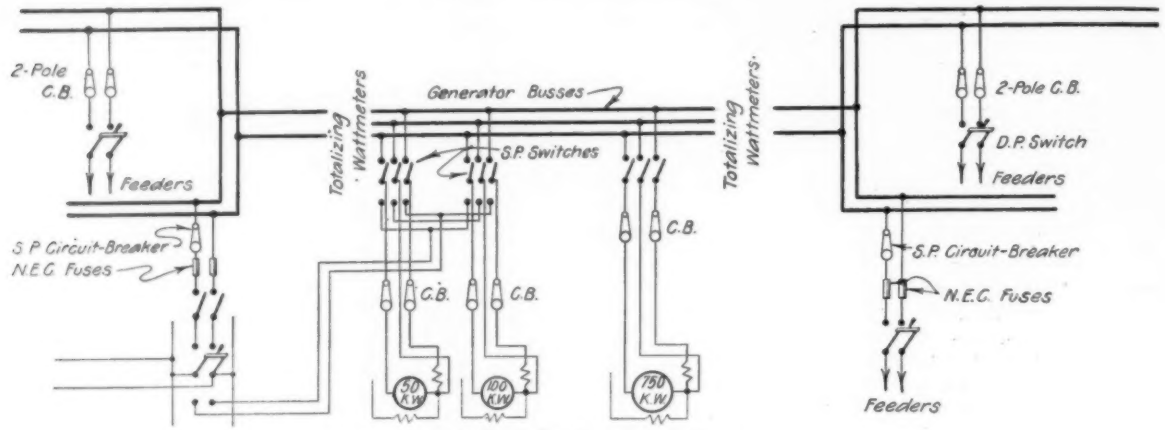


Fig 3.—Diagram of Connections.

erators are connected to the generator busses in exactly the same way as shown in the diagram for the 750-kilowatt machine. The middle busbar is for the equalizer circuit. It will be noticed that this circuit contains neither fuse nor automatic circuit-breaker, the equalizer wire being tapped off at the inner end of the series winding on each dynamo. It is hardly necessary to explain that the equalizer circuit makes possible the operation of the generators in parallel.

All generator switches are single-pole units, and there is one of these units in each generator lead and equalizer connection. Automatic circuit-breakers of "I. T. E," type protect the generators from short-circuits behind the switchboard.

There are certain feeders that supply circuits which must be kept alive nights and Sundays, and at other times when the factory is not in operation, and these are connected to what is known as "the 24-

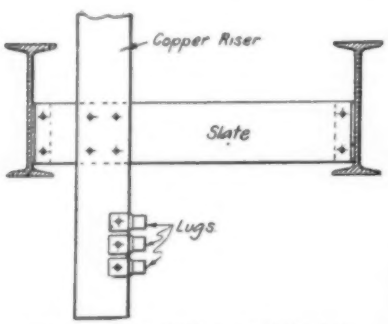


Fig. 4.—Riser With Lugs Attached.

hour board," this being a small switchboard located in the basement under the main switchboard. The method of connecting to this little board is indicated in the lower left-hand corner of Fig. 3. By throwing the double-pole, double-throw switch there shown into the down position and throwing down the switches switch is thrown upward and the single-pole switch above it closed, these circuits are put on the main generator busses.

As the diagram shows, the feeder busbars on the switchboard under consideration are split into two parallel sets. The feeder shown in the upper right-hand corner of Fig. 3 has a capacity of 3,000 amperes. Feeders of this capacity are protected with double-pole circuit-breakers, as is indicated. It is also shown in the diagram how the feeders of larger capacity are protected.

Details of Construction.

In the plant in qnestion the engine room, where the switchboard is located, occupies a first-floor room. All generator leads are carried in rigid iron conduits run underneath the engine-room floor from the generator to a junction box built of No. 10 U. S. gauge steel. This junction box hangs from the basement ceiling. Its cross-section is 36 by 20.25 inches, outside dimensions. It hangs directly under the switchboard, and extends from one end to the other of it. Fig. 5, which is a side view of the junction box, shows how it is supported: pieces of iron with sloping ends are secured to the top of the box, and the thinner ends of these are caught over the webs of the I-beams that support the engine-room floor. It is understood, of course, that the I-beams are transverse to the length of the switchboard and of the junction box.

The conduits enter the junction box through knockout openings and are secured to it by means of standard locknuts and bushings. From the end of the conduit the generator lead is car-

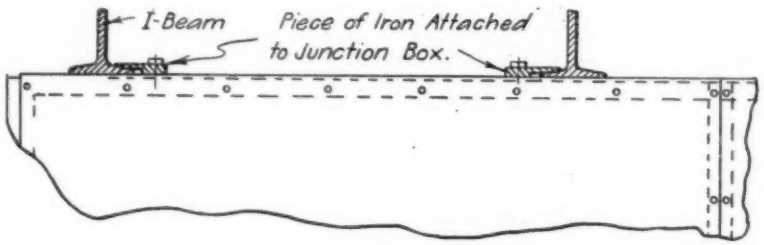


Fig. 5.—Method of Supporting Junction Box.

ried to the lower end of a heavy copper bar which extends vertically down-

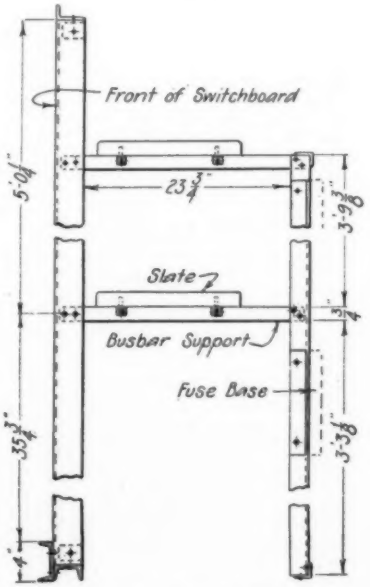


Fig. 6.—End View of Frame.

ward into the junction box from the bushars above, and the lead is attached

to this bar by means of a heavy lug riveted on the end of the bar.

The upper ends of these copper bars—which, by the way, are called "copper risers" in Fig. 7—are attached to the bushars behind the switchboard, of course.

All feeder circuits are run through this junction box similarly. The feeder leaves the box in iron conduit, and connection between the busbar and the box is made by means of a copper riser, just as in the case of the lead from the dynamo to the switchboard. There is an opening in the top of the junction box parallel with its length through which these copper bars enter.

Fig. 4 shows how the weight of the riser is supported. A piece of slate attached to the I-beam forms the support.

Behind the switchboard a slate slab whose length is approximately the same as that of the switchboard, and whose width and thickness are 2 feet, and 2 inches, respectively, is set in the floor so as to bring its upper surface in the plane

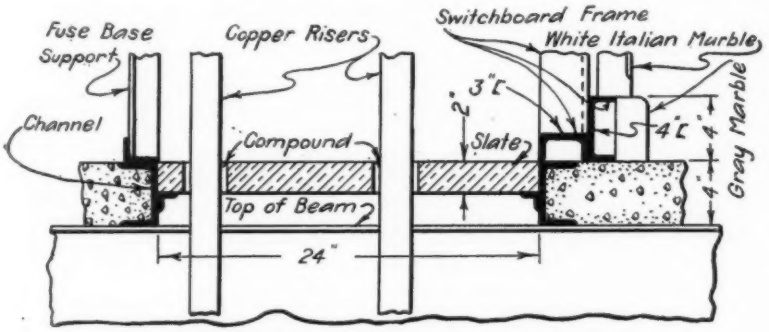


Fig. 7.—Risers Passing Through Slate Slab in Floor.

of the floor. It extends along the back of the board directly under the busbars, and the copper risers between the busbars and junction box pass through rectangular openings in it. After these bars were installed, the openings in the slate were filled with an insulating compound. Fig. 7 is a sectional view of the construction. It will be noted that the frame for the support of the slate was made by laying two channel irons parallel with each other and with their inner surfaces 24 inches apart, and attaching angle irons to these inner surfaces for the edges of the slate slab to rest upon. The section in Fig. 7 is transverse to the length of the slate slab, and therefore along the direction of the beams that support the floor of the engine room.

The slate slab prevents short-circuits between the copper risers where they pass through the floor, and keeps water, dirt, and the like from getting into the junction box.

Fig. 9 is intended to indicate the construction of the front of the switchboard frame. The vertical supports of the switchboard panels consist of angle irons, as is common. Wherever two adjacent panels meet there are two angle irons fastened together as shown; to the sides of these that project in opposite directions in the same plane the panels are bolted. The supporting frame rests on a channel-iron base, attachment being made as indicated. The top horizontal piece of the front of the frame consists

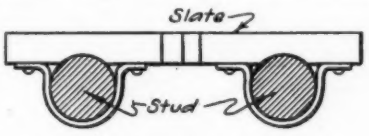


Fig. 8.—Spacer for Risers.

of an angle iron held in position with so-called corner angles like those used at the base of the frame.

An end view of the switchboard frame is shown in Fig. 6. The busbar supports consist of angle irons carrying pieces of slate on top of them, on which the busbars rest. These pieces of slate are drilled on the bottom side and the holes thus formed slip over pins fastened to the irons, and so the slate is held in position.

In the figure just referred to a section of the fuse base is shown. The base consists of a slab of marble equipped

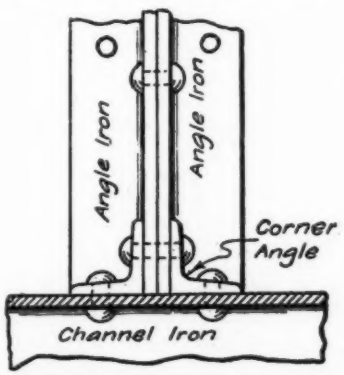


Fig. 9.—Method of Supporting Base of Frame.

with the proper terminals for cartridge inclosed fuses. The base is supported by the angle irons which form the rear of the frame.

Fig. 8 shows a scheme employed to hold the vertical copper risers already referred to in place where these pass near fuse or switch studs. A piece of slate is laid across the adjacent stud as shown, and the vertical copper bars fit edgewise into slots cut along the heavy black lines in the figure.

In conclusion, it may be stated that the aim has been to make this paper of use to the man who designs and erects large switchboards. It is believed that a careful study of the foregoing will help such a man.

Flexible Control of Lamps.

A writer in *Electrical Industries,* an English publication, makes the following interesting remarks relative incandescent lamp switching:

"I am sometimes in doubt whether the average contractor is fully alive to all that can be done in the way of switching. Of one thing I am quite sure, it is exceptional to find a house where switching dodges are employed with freedom and skill. The curse of the cut price seems to pervade the wiring arrangements even in houses where one would not imagine that a five-pound note would be a very tragic consideration. Conversations with my lay friends have made me realize, on the other hand, that the anxiety to get a low price is not the core of the difficulty. In very few instances does the electrical contractor urge, with the voluble eloquence he has at command when he pleases, the high art of up-to-date control. He may know all that can be done to add to the convenience and economy of electric light by a little elaboration in the switching arrangements. But rarely does he come out as a practical missionary for ingenious switch control. To him a switch is a simple switch, and nothing more. If he realized how the gas-man gasps to find a means of distance control applicable to gas supply, he might appreciate what an immense pull he has in the facility of controlling any number of lamps from any number of points anywhere. To my mind it is the bounden duty of every contractor to give each consumer the highest refinement of switch control that the consumer can be induced to take."

An English engineer remarks that so numerous are the improvements in remote control gear, indicating and recording devices, etc., that we are within measurable distance of the time when one man, located in a room apart from the noise and other drawbacks incidental to most industrial processes, will be able to start and control the machinery, regulate the quantity of raw material entering the machine, and keep a constant eye upon the output and quality of the finished product at the same time.

THE SMALL DEALER'S ADVERTISING.

By Richard E. Smith.

Of all the great events in the field of business during recent years, the development of advertising is probably the most remarkable. Here, as in all similar improvements, it is the big business that is responsible for the development of efficient methods and it is the big business man who has reaped the greatest benefit. Here, too, is an opportunity for the small dealer to improve his condition by studying the methods of his big brother.

It has cost a great deal of money to develop the science of advertising to its present position. Many large appropriations have been wasted on ineffective campaigns. Other plans have met with unexpected success. The result is that certain principles have become established and to deviate from them is not wise. The small dealer, through lack of information or genuine carelessness, is the one most apt to go astray, and, after a few unsuccessful ventures, to come to the conclusion that advertising does not pay.

The time has passed when it was necessary to argue the necessity of advertising. Advertising is an integral part of business. Neither is there any occasion to say that it does not pay. If an advertising campaign fails, it is because some fundamental principle has been disregarded.

A thorough discussion of the subject is impossible here. Only a few suggestions will be given, with the hope of starting some small dealer on the right track. He will do well to read some authoritative book on the subject and to talk with the advertising men with whom he deals. They are always glad to lend a helping hand.

The small dealer in the electric game does not realize how much he has wasted on poor advertising. A common tendency among contractors is to bid too low on an important piece of work with the idea of getting advertising out of it. This is a sheer waste of money. The small dealer, too, is the most frequent victim of novelty schemes. These have some merits that are greatly over rated by their inventors. Novelties, bill-boards, calendars, theater curtains and programs, street-car cards, hand-bills, etc., are good only as they supplement a well conducted campaign. Magazines for general and newspapers for local advertising are the mainstays. As our small dealer cannot afford more than one medium, let him stick to the newspapers.

The first principle of the science is that advertising must be persistent. Our dealer must make up his mind to stick to the method he adopts. This shows the prime necessity of intelligent planning at the start. If he stops to figure how much he is going to spend during a period of two or three years, he is more apt to act right at this point.

The slogan, "It floats," used by a soap manufacturer, is a good example of what persistence will do.

Here the question arises: How much should be spent for advertising? Experience has set one per cent to two per cent of the total volume of business as the right amount. This appropriation must be set aside as regularly and exactly as those for rent, insurance and other regular expenses. As it has been assumed that our dealer is doing a business of $3,000 monthly, a monthly appropriation of $40 is about right. As the campaign takes definite shape and the dealer becomes more certain of its success, this amount can be increased to full two per cent, or $60.

hot — — — — —
weather — — —
comforts — — —

A cool breeze means added COMFORT in your home. Our electric fans pay big dividends in COMFORT.

We are agents for the famous Generalhouse Fans.

Our show window this week will interest you. If you cannot come in, telephone West 275 and our representative will call. This does not imply any obligations.

CITY ELECTRIC CO.
422 MAIN ST.

"The Store with the sparkling front."

Specimen Copy.

How to use this money to the best advantage is a matter that deserves the most thorough consideration. In a small city, that is, one of from twenty-five to seventy-five thousand population, there are generally three or four daily papers. Investigation will probably show that two of these, one a morning and the other an evening edition, reach practically all the local trade. The morning paper reaches the business man while the evening edition is the best medium to reach women buyers. So the dealer will probably split his appropriation between the two. After this has been settled, let him turn a deaf ear to all other solicitors.

By making annual contracts, our appropriation can probably be used as follows: a four-inch, single-column "ad" in the evening paper three times a week—Monday, Wednesday and Friday; also a similar "ad" in the morning paper four times a week—Monday, Wednesday, Saturday and Sunday. A little thought will suggest the reasons for selecting these days. There is room for argument about this method. Experience seems to indicate, however, that the frequent small "ad" accomplishes more than an occasional splurge.

General advertising is sometimes divided into two classes, the "argumentative" and the "imperative." As the four-inch "ad" will not allow much text, the small dealer will naturally select the imperative style.

In the small advertisement several things must be avoided. A cut will probably crowd the text and is not to be recommended in our case. A well executed trademark, however, may serve to identify the advertisement if it is used every time. The humorous element must be left out. Formerly this was a common method of attracting attention but it is now generally conceded that its value was over estimated. The people have been educated to look to advertisements for information, and the serious, sober, clean-cut presentation of facts wins their respect. If the copy writer will bear in mind that he is talking to a prospective customer, the "ad" will probably have the right tone. There must be no exaggeration. There is absolutely no chance to win good trade in this way. One sale does not justify an advertisement. The object is to obtain permanent customers.

This brings us to the consideration of copy. To write a good small advertisement requires no mean ability—some are little short of inspirations. Our dealer will probably find that three good advertisements a week will tax his resources.

Every good advertisement should: (1) attract the attention; (2) hold the interest; (3) convince.

The copy shown herewith is a good example of the above as adapted to a four inch "ad." A review of this article will show that this copy conforms with the principles noted.

Here the absence of capitals in the heading attracts attention, while the repetition of "COMFORT" in larger type tempts one to read through the body of the card. The remark about the show window will lead many read-

ers to stop and take a glance; here is a more elaborate appeal to investigate. In this advertisement the "conviction" consists of the general, sober presentation of the case. Its very dignity inspires confidence. The slogan at the bottom identifies the store. Many buyers who pay no attention to the address "422 Main St." will at once get a mental picture of the flashing lights that they see every time they are down town at night. There is little danger of their going to the wrong store.

The avoidance of cuts and heavy type in this advertisement leaves room for about fifty words of text, enough for any simple message.

Attention has been called to the necessity of maintaining a "style." In the copy under consideration the "style" consists of the brief heading, always made up in lower-case letters and arranged the same way; the well delivered message, always about the same length; the name and address of the dealer followed by the slogan. Further, the dealer should try to have his copy always in the same position in the paper. This can usually be arranged. In advertising, as in anything else, all the points of vantage should be considered before any contract is signed.

Before adopting a style, the dealer should study the work of other advertisers. He will find that many prosperous merchants are following the plan he is considering and that the smaller of these are using about the same space that he will take. He can soon distinguish between the copy that has been carefully prepared and the makeshift stuff that is just thrown together. Unfortunately, the latter seems to predominate.

The average amateur cannot sit down and turn out copy any time he wants to. For this reason one should not wait until the last minute to prepare copy. A notebook comes in handy and one can jot down ideas from time to time, to be used at a later date. A scrapbook should also be kept of all the copy as it is published. This is a valuable reference. After a thorough campaign, the scrapbook can be compared with the record of sales and the comparative value of different schemes observed. Copy that has been productive can be repeated, while any that has not been effective can be analysed and future errors avoided. In this same book one can keep clippings of other advertising that seems to be particularly convincing and the electrical dealer can adapt it to his needs at some future time. An occasional spread-eagle "ad" of a competitor may tempt our dealer to swerve from his course. He should discount all that at the beginning and be determined to win his battle by steady plugging. It is the safest and surest way.

Of course it is taken for granted that the advertising will be supported by the rest of the business. Unless the stock and the salesmen are prepared to handle the new business that is being solicited, it is better to delay the advertisement a few days. As a matter of fact, good advertising is an incentive to the salesman. He feels that his reputation as well as that of the store is at stake and it behooves him to put his best foot forward. In a small store it is often good policy to consult the salesman about the advertising and also to let him try his hand at preparing copy. He may have latent ability than can be developed to good advantage.

In a small business it is not necessary to charge the show window to advertising, as there is really no expense in connection with it. The maintenance of the electric sign, however, should be charged to this account.

The question as to who really pays for advertising is one that is constantly recurring. One would say on first impulse that the cost falls on the consumer, as it is a definite part of the selling expense like rent and salaries. Now, take the case of the merchant who does not advertise. Let us assume that he has an overhead expense of 25 per cent. By adopting modern business methods including analytical accounting and scientific advertising, he increases the volume of business without proportionately increasing the expense so that a new statement shows an overhead of only 20 per cent. This is rather a common occurrence. One can argue from this that the man who trades with the non-advertiser really pays for the advertiser's publicity. It is like the old standby: Which travels faster, the hub or the rim of a wheel? Let those who enjoy argument try to figure it out. The fact remains that advertising is an essential factor in modern business and must be recognized as such by the small electrical dealer as well as by his larger brother.

Municipal Electricians to Meet.

The eighteenth annual convention of the International Association of Municipal Electricians will be held in Watertown, N. Y., August 19-22. Headquarters will be at the New Woodruff Hotel and the convention meetings and exhibits will be held in the Odd Fellows Temple, just a few steps away. Arrangements are being perfected for what is expected to be the largest convention of municipal electricians that has ever been held. Valuable papers on live subjects are being arranged for. The scope of the Association has been extended and the papers and discussions will include not only fire-alarm and police signaling, but also electrical inspection, municipal lighting, the joint use of poles, permissible voltages on overhead wires in cities, standardization of specifications for cables for municipal purposes, and municipal ownership. A special committee has been appointed to prepare a new constitution and by-laws and will report to the Executive Committee for its approval previous to the convention. There will be a meeting of the Executive Committee on Monday, August 18, at Watertown. Ample provision is being made for the entertainment of those who attend the convention. John W. Kelly, Jr., of Camden, N. J., is the president of the Association.

Among the Contractors.

The electrical work in the new addition to the Iowa State Masonic Library will be installed by C. E. Fawcett, of Cedar Rapids, it is stated.

F. A. Clegg & Company, Louisville (Ky.) electrical contractors, have been awarded one of the most important contracts of the season, that for the installation of the elaborate electrical equipment and wiring required for the new National Theater, now being completed in Louisville. The job amounts to $10,000, and a motor-generator set and other equipment will be installed. All the wiring will be in conduit.

A. Becker & Son, Cincinnati, O., have the contract for the electrical installation in the store building of the John Shillito Company at Seventh and Race streets, Cincinnati.

The Sanborn Electric Company, of 115 North Illinois Street, Indianapolis, Ind., will soon begin the erection of a new fireproof building to be used as its business headquarters. G. M. Sanborn, a former president of the National Electrical Contractors' Association, is this company's head.

William G. Reuter, Cincinnati, O., has the contract for installing the electrical apparatus in the new building now being erected for the University of Cincinnati. It is known as the Hanna, Cunningham and McMicken Hall. The work involves $10,000.

The Elliott-Lewis Electrical Company, Philadelphia, Pa., announce that its business has outgrown its present quarters, and alterations will be started shortly which will provide additional space in the building adjoining at 140 North Tenth Street.

WIRING SCHEME FOR NEW TYPE OF GARAGE.

By H. G. Wilson.

Numerous recent destructive fires in the usual type of garage, with its large, unrestricted floor space, where the space is used mostly for storage of cars, has resulted in a new design of building having its floor space divided up into separate fire-resisting compartments for the storage of cars. The electric wiring for these sections, while it presents no particularly novel features, as a rule, is remarkable in that it shows that where advantage is taken of the large and flexible line of fittings now on the market the fire hazard of electric wiring in such places may be reduced to a quantity that is practically negligible. The electrical work in one of these garages which the writer recently inspected struck him as being particularly interesting. The layout is described in the following notes:

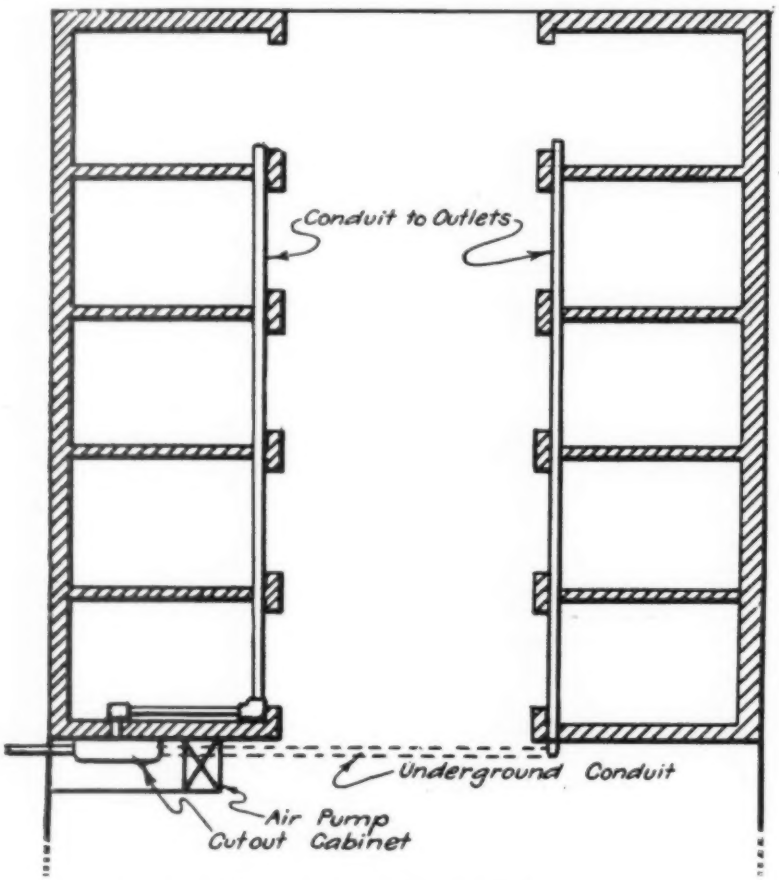


Fig. 1. Arrangement of Cutout and Circuits.

Fig. 1 is a plan of the building in which the arrangement of the circuits is indicated in a general way. It will be noted that the service entrance is located outside the garage. Here the service switch and fuses are installed in a cabinet, where branch circuits are taken off for a small motor-driven air pump and for those lamps which all the tenants use in common. The cutout cabinet and motor are inclosed in a weatherproof inclosure.

As is indicated in Fig. 1, the compartments for cars are arranged along the opposite sides of an aisle which extends throughout the length of the building. A line of conduit extends along the inner side of the front walls of each row of compartments, this run of horizontal pipe being placed so as to pass just above the doors opening into the central aisle. The line of conduit on the near side is connected directly to the service cabinet by means of an overhead run, while that on the side opposite the cutout cabinet is connected with the latter through an underground pipe in which lead-covered conductors are employed. At one side of the door of each section of the garage a branch circuit is taken off and run downward through a condulet fitting and vertical conduit to a lamp outlet and receptacle for an attachment plug, the lamp receptacle and that for the attachment plug being arranged one above the other. Fig. 2 shows the arrangement. No attempt is made, however, to show locations of condulets in Fig. 1. Their position is obvious from Fig. 2.

The lamp is provided with a strong guard and the extension from the other receptacle is made of the usual reinforced portable cord, the lamp at the remote end of it being furnished with a strong guard having a rigid handle. In the case of each extension, moreover, the cord is anchored to the wall at the attachment-plug end in the manner indicated in Fig. 3, and thus the breakage of plugs by their being pulled out and dropped on the concrete floor is reduced to the lowest possible minimum.

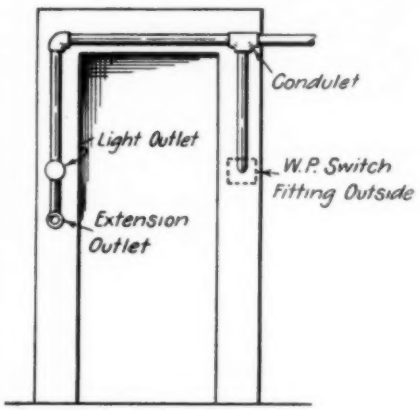


Fig. 2. Wiring in Car Stall at Remote End of Room.

The lamp and attachment plug outlets are controlled by means of switches installed in weatherproof outlets and located outside the doors, there being a switch beside each door for the control of the outlets on the inside of the room. Thus the user of any one of the stalls can turn on the light in his compartment before the door is opened if he cares to do so, as is clear from Fig. 2.

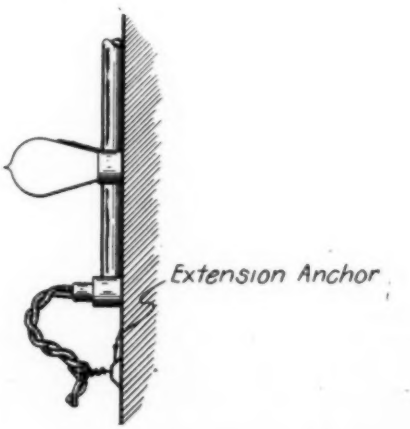


Fig. 3. Lamp and Extension.

Dollar Wiring Kinks.

Every reader is invited to contribute to this column. It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; and if a diagram is necessary, a rough pencil drawing will serve. The idea itself must, of course, be new and bright. A dollar will be sent to the contributor upon publication.

Keeping Walls Clean.

I have just completed the installation of a number of flush switches and receptacles in a large dwelling where the walls are finished in very delicate colors. It was plain that the walls would have to be protected from the tools and imprints of the hands or they would become very badly soiled.

I secured several large sheets of medium-weight cardboard and cut a hole in the center of each, just the same shape and a little larger than the box I was putting in. After marking the outlines of the box on the wall, I took four very small brads and fastened each corner of the board to the wall. I then proceeded to cut the hole for the gang-box by working through the hole in the cardboard.

In every case, after the hole was cut and the fitting in place and the cardboards removed, the walls were as fresh and clean as when the work began. W. A. Hines.

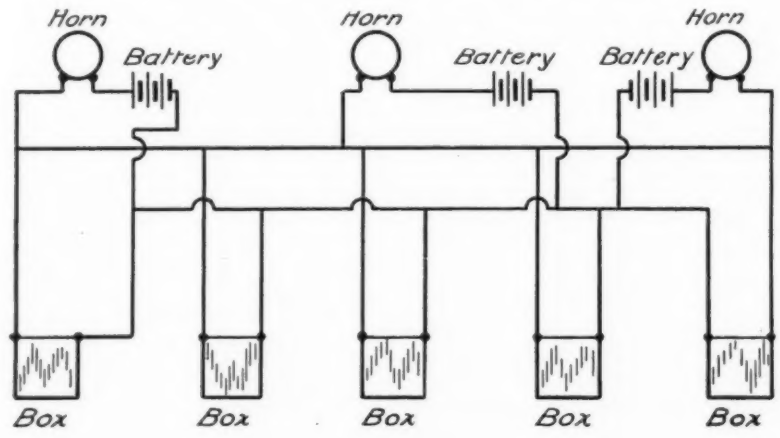


Fig. 1.

Drilling Walls.

In drilling walls for any purpose—for wood plugs, expansion sleeves, or for through holes—a good many men, after striking the blow, hold the drill in hard against the bottom of the hole, and then give it the quarter turn and strike again. Here is a better method. After striking the blow, pull the drill out just a little, give it the quarter turn and strike again. This will send the drill in with added force, and the displacement of the air in front of the point of it will drive the brick dust out to a considerable extent. The action is identical with any ordinary steam drill in a quarry.

Wm. E. Rhodes.

Cutting Holes in Service Boxes.

I have a better way of cutting holes in service boxes than that recommended by F. Husar in the Kink which appeared in the issue of July 26, I think. I take a five-sixteenth-inch bit in an angle brace or a breast drill and drill a hole in the panel box, after which I ream the hole out. If the conduit to be inserted is larger than three-quarters of an inch, it may be necessary to file out the hole with a round file after the reaming has been done.

I have used this kink often, and find it very satisfactory.

A. B. Whiteman.

Another Way of Cutting Them.

My way of cutting holes in the bottom, or back, of a service box is as follows:

I take a No. 7 drill and drill holes all around the circumference of the hole to be cut. When this has been done, it is easy enough to finish the job with a cold chisel. J. C. Walsh.

Wiring a Fire Alarm.

There was a fire-alarm system in a shop which consisted of six small boxes intended to operate alarm horns in different parts of the shop, and which was run on dry cells. It was found that by connecting batteries as shown in Fig. 1, that the horn that was easiest started would take all the current (no difference how many dry cells we used), and the other horns would not work at all. To overcome this difficulty we wired the system as shown in Fig. 2. This method not only saves wire but is much easier and better than the old way. In the figures, the lines representing the tops of the fire-alarm boxes must not be mistaken for electric conductors by the reader.

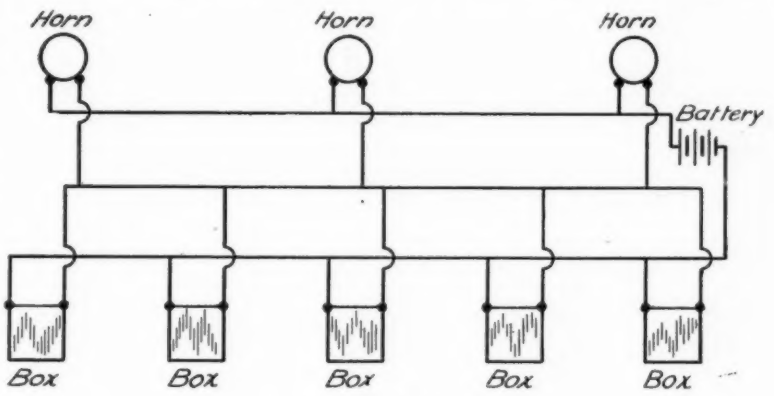


Fig. 2.

Karl S. Wonderly.

Installation of Hangers.

Where bolts have to be fastened in brick or concrete structures for the purpose of attaching conduits or other things, the following procedure is a good one to follow:

When a hole has been drilled for the bolt a washer should be placed on the latter and the bolt shoved head first into the hole. Small strips of sheet lead long enough to extend around the bolt should then be inserted in the hole. As the final step in the process, the lead should be pounded in with a hammer and piece of iron pipe. The pipe should be of a size to practically fit the hole in which the bolt has been placed, and the inside diameter of the pipe should be such as to allow it to be slipped over the projecting end of the bolt readily. When the hole has been filled with lead in this way, it will be found that the bolt will carry a surprisingly heavy load. D. E. Ecker.

Public Service Commissions

MAINE.

Governor Haines of Maine has appointed September 14, 1914, the date of the next general election in that state, as the day on which the Public Utilities Act, passed by the last Legislature, shall be passed upon by the people. More than 10,000 voters petitioned for a referendum of the measure, hence the operation of the act was suspended until such time as the popular vote shall endorse it.

MASSACHUSETTS.

The Massachusetts Public Service Commission has granted the petition of the Middlesex & Boston Street Railway Company for permission to carry district nurses free of charge. Formerly free transportation was granted district nurses voluntarily by the company, but the Washburn railway law recently enacted forbade the granting of passes except in rare cases, when approved by the Commission.

The city government of Pittsfield, Mass., has granted the petition of the Berkshire Street Railway Company to extend its line from West Pittsfield to Barkerville, a distance of 3,800 feet. A hearing will be held Sept. 2 on the company's petition for right of way in Pittsfield for a line which the company proposes to construct with a view to making a direct route to Albany, N. Y.

The electric light commission of Westfield, Mass., is conferring with officials of the Amherst Power Company on the subject of a proposition of that company to furnish power in the town of Westfield.

The City Council of Pittsfield, Mass., has voted to institute an investigation of the Pittsfield Electric Company, but the mayor vetoed the measure on account of the cost, but recommends that the two lighting companies of the city be investigated together and that the state commission be appealed to. The aldermen of the city, in turn, defeated an order of the mayor by which the latter would be instructed to petition the Massachusetts Gas and Electric Light Commission to hold a hearing in Pittsfield on the prices of gas and electricity in that city.

The Massachusetts Public Service Commission has authorized the Nahant & Lynn Street Railway Company to construct an extension of its line in Nahant on private land and on certain streets of the town.

NEW YORK.

The Public Service Commission for the First District has written to the Secretary of War asking the consent of the United States Government to the construction of two tunnels under the East River, for operation by the Interborough Rapid Transit Company and the New York Municipal Railway Corporation under the Dual System contracts. As the War Department has jurisdiction over navigable streams, its consent is necessary before the City can proceed with the construction of a tunnel under any such stream. One of the tunnels will be built under the river from Old Slip, on the Manhattan side, to Clark Street on the Brooklyn side. This will be used by the Interborough Rapid Transit Company, and will connect through William Street and Park Place with the proposed west-side extension of the existing subway up Seventh Avenue, on the Manhattan side, and with the existing subway in Boroklyn. The other tunnel will run from Whitehall Street, Manhattan, to Montague Street, Brooklyn. It will be operated by the Brooklyn company, and will connect on the Manhattan side with both the Nassau Street extension of the Centre Street loop subway and with the subway running up Broadway. On the Brooklyn side it will connect with the Fourth Avenue subway. These tunnels will be built not less than 45 feet below the mean low water mark.

The first part of the Dual System to be placed in operation is the Centre Street loop subway in Manhattan, which was placed in operation on August 4 by the trains of the New York Consolidated Railroad Company, in accordance with the contract between the City and the New York Municipal Railway Corporation.

The Public Service Commission for the First District has approved a further issue of $400,000 of the capital stock of the New York Municipal Railway Corporation. This company's total authorized capital is $1,000,000, and when it was organized the Commission allowed an issue of $100,000 to cover perliminary expenses. With the $400,000 just allowed, the company now has permission to issue one-half of its total capital stock. In granting permission to issue this $400,000, the Commission stipulates that it shall be sold at not less than par, shall be issued for money, and that the proceeds shall be applied only for acquisition of property, or for construction, completion, extension or improvement of its facilities, or for the discharge or lawful refunding of its obligations.

OHIO.

The Public Service Commission of Ohio has authorized the Cleveland, Southwestern & Columbus Railway Company to issue 25-year, five-per-cent, first consolidated mortgage bonds to the par value of $251,069.62. The proceeds are to be used to reimburse income account for money expended in the acquisition of real estate and the extension and improvement of the company's interurban electric railroad. The bonds must be sold at not less than 85 per cent of par value. Pending their sale, the company is authorized to hypothecate the bonds as security for certain loans to total not less than 65 per cent par value.

OKLAHOMA.

Reaffirming a former holding, the Corporation Commission has decided in the case of the Oklahoma Traction Company of Oklahoma City that a city has the right to reserve a street to the public by ordinance and prohibit the construction of a street railway thereon, even though a street railway company has previously been granted a blanket franchise, covering all of the streets of the city.

The Corporation Commission, in a case from Tulsa, has decided that the Tulsa Street Railway Company should not be compelled to operate cars over a stretch of track that seemed dangerous. Complaint had been made that the company had ceased running cars on a certain line. The Commission investigated the track and found it in a dangerous condition. The opinion of the Commission was that the railway company exercised very poor judgment in adopting that particular street for its line, and that to compel the company to operate cars there would result in service that would be dangerous. The case was dismissed without prejudice, being left so that it could be re-opened at a later date if additional evidence should be presented to justify such action.

THE UNBALANCING EFFECT OF GROUNDS.

By R. S. Brown.

Connecting one wire of a high-tension, three-phase, transmission system to earth may produce a variety of effects on the connected apparatus. If the system be operating with grounded neutral, the effect will be similar to a short-circuit and the protective apparatus will disconnect the grounded line from the system.

If the neutral be ungrounded the effect will depend to a large extent on the resistance of the ground connection and may even be so slight that the system will continue in operation. If the ground be an arcing one, due to a broken insulator, trees touching the line, or some similar cause, high-frequency disturbances may be set up. If, however, the ground is a dead one, that is, of zero resistance, a definite change will be produced in the charging currents of the three wires, which may be calculated with some approach to accuracy, and it is the purpose of this article to formulate a means of calculating this unbalancing.

From the voltages and the geometry of the circuit, the charges, and hence the charging currents, in every unit length of line and earth may be found. The total charging current will then be the sum of these elemental currents.

The following equations are deduced by the application of the law which holds for parallel, linear charges, the charges in this case being assumed to be concentrated along the axis of the conductor.

The work done, hence the potential difference, in moving a unit charge of electricity from one point in an electrostatic field to another, is equal to the sum of the products $2\ Q\ log\ d_1/d_2$, where d_1 is the initial distance from any linear charge and d_2 is the final distance.

The effect of the earth, considered as an equipotential plane, may be represented by the electrical images of the conductors at a distance h below the surface, equal to their real height above. In the following discussion the conductors will be assumed to be equally distant, d, from each other, all at the same height, h, above the earth, and all distant, x, from any point P on the earth's surface. (See Fig. 1.). The inequalities in distance may be taken into account if desired, but the increased accuracy does not justify the trouble. The radius of the conductor will be represented by r.

Moving the unit charge from 3 to 2, 1 to 3, 2 to 1, and P to 1, respectively, the following system of equations is obtained, with wire 1 grounded.

$$E_1 = 2Q_2\ log\ d/r + 2Q_3\ log\ r/d$$
$$E_2 = 2Q_1\ log\ r/d + 2Q_3\ log\ d/r$$

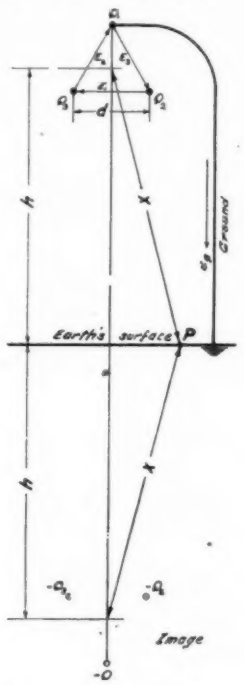


Fig. 1.

$$E_3 = 2Q_1\ log\ d/r + 2Q_2\ log\ r/d$$
$$e_g = 2Q_1\ log\ x/r - 2Q_1\ log\ x/2h + 2Q_2\ log\ x/d - 2Q_2\ log\ x/2h + 2Q_3\ log\ x/d - 2Q_3\ log\ x/2h$$

Let

$$a = 2\ log\ d/r$$
$$b = 2log\ 2h/r$$
$$c = 2\ log\ 2h/d$$

The above system then simplifies to:

$$E_1 = aQ_2 - aQ_3$$
$$E_2 = aQ_3 - aQ_1$$
$$E_3 = aQ_1 - aQ_2$$
$$e_g = bQ_1 + cQ_2 + cQ_3$$

And the solution for Q is:

$$Q_1 = \frac{c(E_3 - E_2) + a\,e_g}{a(b+2c)}$$

$$Q_2 = \frac{cE_1 - bE_3 + ae_g}{a(b+2c)}$$

$$Q_3 = \frac{bE_2 - cE_1 + ae_g}{a(b+2c)}$$

If e_1, e_2, e_3, are the star voltages of the system, that is, drawn from the vertex to the center of gravity of the voltage delta,

$$E_1 = e_2 - e_3$$
$$E_2 = e_3 - e_1$$
$$E_3 = e_1 - e_2$$

Eliminating E_1, E_2 and E_3 from the above system, and remembering that $a + c = b$ and that $e_1 + e_2 + e_3 = o$,

$$Q_1 = \frac{e_1}{a} - \frac{e_1 - e_g}{b+2c}$$

$$Q_2 = \frac{e_2}{a} - \frac{e_1 - e_g}{b+2c}$$

$$Q_3 = \frac{e_3}{a} - \frac{e_1 - e_g}{b+2c}$$

With the ground on wire 1 removed, $e_1 = e_g$ and the charge in each case becomes merely the star voltage multiplied by the capacity to neutral, C.

$$C = Q/e = 1/a = 1 \div 2\ log\ (d/r)$$

If the earth is at the same potential as the grounded wire, which will be the case if the impedance drop in wires and ground connection is zero,

$$e_g = o$$

and

$$Q_1 = \frac{e_1}{a} - \frac{e_1}{b+2c}$$

$$Q_2 = \frac{e_2}{a} - \frac{e_1}{b+2c}$$

$$Q_3 = \frac{e_3}{a} - \frac{e_1}{b+2c}$$

The charge on the ground is the negative sum of the charges on the wires, hence,

$$Q_g = 3e_1/(b+2c)$$

The charging current in each case is the time rate of change of the charge and since Q is a harmonic function of time in phase with the voltage,

$$i = dQ/dt = jk\omega Q$$

j indicates that i is 90 degrees ahead of Q, ω is 2π times the frequency. k is a constant to change from electrostatic units to practical units and from logarithms to the base e to logarithms to the base 10.

$$k = 7.75 \times 10^{-8}$$

Hence the elemental currents are

$$i_1 = jk\omega\left(\frac{e_1}{a} - \frac{e_1}{b+2c}\right)$$

$$i_2 = jk\omega\left(\frac{e_2}{a} - \frac{e_1}{b+2c}\right)$$

$$i_3 = jk\omega\left(\frac{e_3}{a} - \frac{e_1}{b+2c}\right)$$

$$i_g = jk\omega\,\frac{3e_1}{b+2c}$$

From the above it is seen that the effect of grounding one wire is to add to each of the three normal charging currents a component,

$$p = \frac{k\omega e_1}{b+2c} = \frac{k\omega e_1}{2\ log\frac{8h^2}{rd^2}}$$

90 degrees behind the star voltage to the grounded wire.

The charging currents at the generator end of the line may be found by multi-

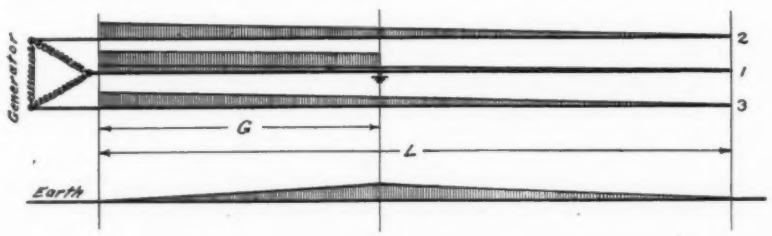


Fig. 2.

plying these elemental currents by the length of the line, in miles, which is being charged.

In the case of the grounded wire the current between the generator and the ground connection is increased by the amount of the current which flows through the ground connection into the earth. This current then divides as shown by Fig. 2, and flows in both directions through the earth, parallel to the line, until it diminishes to zero at the ends of the line.

For ordinary types of line construction, the added component of charging current due to grounding is about half the magnitude of the normal charging current.

The distortion of currents may be seen from Fig. 3, where n respresents the normal current and i the current after grounding. Since the component due to grounding is the same in each wire, it is evident that the impedance drop due to these components will not affect the symmetry of the voltage delta. The current flowing through the ground connection,

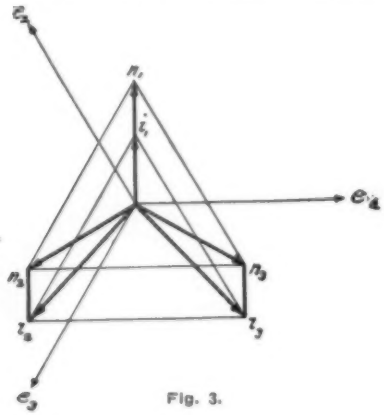


Fig. 3.

is, however confined to wire 1 and its effect will be to shift the apex of the voltage delta outward along a line making the angle $tan^{-1}x/r$ with the base.

Since this angle for ordinary types of construction is about 60 degrees, this shift will be almost in line with one side of the voltage delta, and if voltage unbalancing be defined as the difference between the highest and the lowest delta voltage divided by the lowest, it may be expressed as,

$$U = IzG/E$$

where I is the current flowing through the ground into the earth,

z is the impedance per wire-mile in ohms $= \sqrt{r^2 + x^2}$,

G is the distance from generator to point of grounding.

The unbalancing at all points beyond the ground will be practically the same and for points between generator and ground in proportion to the distance.

I expressed in amperes will be,

$$I = 3pL = \frac{3 \times 7.75 \times 10^{-8} \times 2\pi E}{2\sqrt{3} \log \frac{8h^3}{rd^2}}$$

$$I = \frac{42.2 \times 10^{-8} fLE}{\log \frac{8h^3}{rd^2}}$$

Where f is the frequency and L is the total length of line.

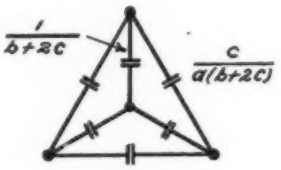


Fig. 4.

Applying the above equations to an example, in which

$f = 60$ cycles,
$L = 150$ miles,
$E = 44{,}000$ volts,
$z = 1.1$ ohms per mile,
$G = 75$ miles,
$h = 30$ feet,
$d = 6$ feet,
$r = 0.125$ inch;

we get

$U = 6.7$ per cent,
$I = 35.7$ amperes.

By reference to the equations for elemental charge on a unit length of line in terms of the delta voltage, it will be seen how a transmission line may be constructed artificially, for experimental purposes, by representing the capacity of each unit length by a set of six condensers, arranged as shown in Fig. 4.

Under normal conditions this is equivalent to Fig. 5.

The effect of a ground on any wire may be represented by connecting that wire to the condenser neutral, which represents the earth. The voltage from wire to neutral will then be e_s and the equation for charge on any wire may be duplicated by adding the charges on all the plates connected to the wire.

The value of capacity for which each condenser should be designed is indicated on the diagram in terms of the line con-

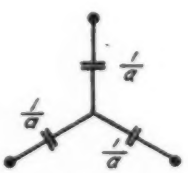


Fig. 5.

struction constants, a, b, and c. It will be noticed that in the normal case all the constants disappear except a, which is not a function of h. That is to say, the height of wires above earth has very little effect upon the normal charging current.

Such artificial lines, in which the capacity of every ten miles is represented by a set of six condensers, have been constructed and give very good results.

Electrical Power Transmission System for Panama Canal Zone.

Construction work has been begun upon the permanent electrical transmission line across the Isthmus. As recently described in *The Canal Record*, this line is to supply electrical energy needed for the operation of the Panama Canal and its auxiliaries. The transmission line is fundamentally to transmit electrical energy from a source of generation at Gatun to load centers at Miraflores, Balboa, and Cristobal. The system is simple and straightforward. At the Gatun spillway, a portion of the lake water will be passed through turbines to generate electrical energy. The energy, generated at 2,200 volts, 25 cycles, three-phase, will be carried along the east wing of Gatun dam by heavy cables in duplicate underground duct lines, and through tunnels under the locks, into a transformer substation, situated on the east side of the locks. The duct lines are in duplicate, to insure maximum safeguard against damage in event of a burnout of a cable in one or the other of the lines, and are to be laid approximately 600 feet apart.

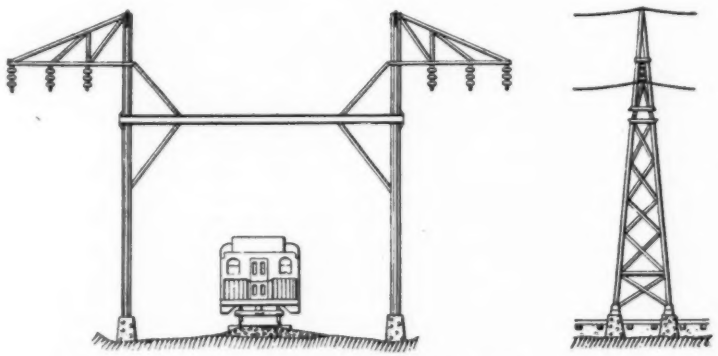
At the Gatun substation, which is to be situated at the north end of the hill upon which the present Atlantic Division office building stands, the electrical energy will be transformed from 2,200 volts to 44,000 volts by means of step-up transformers. The equipment, in addition to three 2,000-kilowatt transformers, will consist of the necessary lightning arresters, oil switches, buses, control board, and other auxiliary appurtenances. Two high-tension lines will emerge from the substation and tap into duplicate transmission lines.

The transmission line will run from Cristobal to Balboa, completely across the Isthmus, permitting distribution of energy both ways from Gatun. The line is to parallel the right of way of the Panama Railroad for its entire length. At Cristobal and Balboa will be terminal substations similar to the Gatun substation. The terminal substations will receive the energy at 44,000 volts, less the voltage drop in the line, and step-down transformers will convert the pressure to 2,200 volts, which will be the distributing voltage for all circuits. At Miraflores, a substation will be installed for supplying energy for the motors and lamps of Pedro Miguel and Miraflores Locks.

If electricity is required along the line, the transmission lines will be tapped by outdoor type of transformer substation equipment. This will probably be done at Caimito, to supply electricity to the high-power radio station; at Monte Lirio, to supply power to the bascule bridge, and at any permanent town or military reservation which de-

mands electricity for lights and power.

At Miraflores, the present steam turbogenerators will be tied into the permanent electrical system through 2,200-volt tie-lines extending to the Miraflores substation. This steam station will serve as a reserve in the event the hydroelectric station at Gatun should break down. In emergency, energy from Miraflores will be transmitted back to Gatun and to the terminal substations at Cristobal and Balboa, insuring a continuity of service on the system at all times. The present steam station at Gatun, which has been operated during the construction period, may be abandoned in a year or two if conditions warrant placing entire dependence upon the water power. It will, however, be tied temporarily into the system, until abandonment, and will also be required to supply energy to Gatun Locks until such time as the transmission system is fully installed.



Front and Side Views of Transmission Bridge Structure.

The type of transmission line which has been adopted has track-span bridges which support one of the duplicate three-phase lines upon each side of the railroad tracks. Each of the three power conductors is carried from suspension insulators attached to a long side bracket. The conductors are No. 00 in size, and are five feet apart and five feet from the frame. The insulators are made of vitreous porcelain, in three units, which is ample to sustain the impressed potential of 44,000 volts. The insulator fittings are made entirely of Monel metal to resist climatic corrosion. A ground wire for protection against lightning is carried at the top of each side frame. The ground wire is five-sixteenths inch copper-clad solid steel wire. The copper-clad wire is being furnished with a copper sheath of nearly one-half the area of the wire, surrounding an amalgamated, carefully selected steel core.

The steel bridges are spaced on 300-foot centers, a total of 917 being required across the Isthmus. The span between side frames is 36 feet. The track-span bridge, in addition to supporting the duplicate transmission lines, admits of the suspension of a catenary trolley construction, should it prove desirable in the future to electrify the Panama Railroad.

The construction adopted has several advantages for transmission purposes. By paralleling the Panama Railroad, material can be brought to within a very few feet of the point of actual erection. The side bracket suspension of the conductors separates the duplicate lines so that a burnout in one will in no manner affect the other. The conductors are outside the track and will be comparatively free from deterioration caused by smoke from the locomotives. The structure itself is fundamentally strong and is capable of easily resisting all strains introduced by breaks in the wires.

A few details of construction are worthy of note. The No. 00 copper conductors are seven-strand pure copper cables, totaling 1,500,000 feet in length. The individual strands are manufactured without either a soldered or a welded joint. Splices in the cable will be made with soft-copper sleeves. The conductors are suspended at the insulators from Monel metal fittings, which are bushed with a copper sleeve. Thus, in the entire length of line, there will be no point where the copper strands are in intimate contact with a second metal; this prevents the introduction of an electric couple and consequent electrolytic deterioration.

At each track-span bridge, the ground wire will be clamped to the tower, and a positive T-connection through a copper wire will be made to ground plates buried in the earth. These ground plates are being manufactured from old scrap copper and cable which have accumulated at the Empire storehouse. By frequently grounding the ground wires, it is expected that line trouble and substation burn-outs caused by lightning will be reduced to a minimum. Five hundred thousand feet of copper-clad wire are required for the two ground wires.

The insulators, which will support the conductors, are of two types, suspension and strain, each assembled of three porcelain disks, ten inches in diameter, joined by Monel metal fittings. This metal is used on account of its unusual strength and its ability to resist corrosion; galvanized fittings which are customarily used in the United States and abroad are considered practically worthless in the Isthmian humidity. The strain insulator is to be used on sharp curves and for anchoring at intervals, and the suspension insulator is to be used upon tangents and light curves. The suspension insulator swings freely from the bracket, while the strain insulators take the position of the conductors and hold the conductors more rigidly to a line. Each wire requires two strain insulators per bridge on sharp curves, and one suspension insulator is required for each wire per bridge on tangents and light curves. Four thousand suspension insulators and 2,500 strain insulators, have been ordered for the entire line. The total weight of the copper conductors, including the ground wires, will be approximately 400 tons.

In the design of the bridge the steel is distributed, so as most efficiently to resist the maximum stresses incurred. The side frames are A-frames, to resist uprooting of the bridge in event all wires are down in one span. The crosspiece is made of two channels, which are crossbraced to carry the longitudinal pull of the catenary construction which may be attached if the railroad is electrified. The side brackets for supporting the line conductors are three-legged, designed both to support the weight and to resist the torsional pull of the wires. The brackets and the crosspiece are braced to the side frames, so that the entire bridge acts as a unit to resist side pull on sharp curves.

The type of concrete foundations for the track-span bridges has been given considerable study. The standard foundation will consist of two pedestals under the two legs of each side frame, the pedestals resting upon a spread slab, which latter is reinforced by scrap steel rails. Each leg of the side frame is to be secured to the pedestal through two 15-inch anchor bolts, which are clamped at the lower end to the steel rails in the spread slab. Provision for anchoring the foundations is made by extending downward long reinforcing rods, encased by concrete in a drilled hole, which latter has been sprung at the bottom with light charges of dynamite. This foundation should afford a thorough footing, both for the normal bearing and for anchorage to resist side pull when wires are broken.

Large Spanish Hydroelectric Project.

From a recent report by United States Consul H. H. Morgan, of Barcelona, Spain, are obtained the following particulars of one of the largest hydroelectric enterprises in the world, which is now in course of construction in the district of Catalonia by the Barcelona Traction, Light & Power Company, organized under the laws of the Dominion of Canada, with a capital of $25,000,000 and a bond issue of $35,000,000 authorized. The company's head offices are in Toronto, Canada, and its headquarters in Spain are in Barcelona. This company owns the shares of various subsidiary companies in Spain, the principal ones of which are the Ebro Irrigation & Power Company, the Cataluna Railways Company, the Barcelona Electric Company and the Sarria Railway. While the capital has been entirely subscribed in Canada, England, France, and Belgium, the engineering part of the work is being done almost exclusively by Americans, nearly 250 being now employed in one capacity or another.

The general purpose of the enterprise is the development of the electrical industry in Spain. The company owns concessions for the development of various water powers on the Noguera-Pallaresa River and the Segre River, and has under construction along these rivers plants which will develop a total of about 140,000 horsepower. The first of these plants, which will develop about 4,000 horsepower, is located near the town of Pobla, in the Province of Lerida, and is nearing completion. The second is located near the town of Seros, also in the Province of Lerida and on the Segre River, and will have an installed capacity of 56,000 horsepower. It is expected that this plant will be in operation at the end of 1913.

The third plant, and the most important of the three, will be located on the Noguera-Pallaresa River, above the confluence with the Segre River, and will develop about 80,000 horsepower. A dam 249 feet above water level and 26 feet below water level is in course of construction across the gorge of the Noguera-Pallaresa River, below Tremp, which will form a lake 6 miles long and 2.5 miles wide, and which will contain 57,500,000,000 gallons of water, of which 32,500,000,000 gallons will always be available for storage reserve for use during the dry seasons. The length of the dam at the bottom will be 197 feet and at the top 951 feet, and the width at the bottom and top 184 feet and 23 feet, respectively. A tunnel has been built to divert the river during the construction of the dam and within a few days the river will be diverted, when the excavations for the foundations of the dam will be commenced. An idea of the extent of the dam may be gained from the statement that 425,081 cubic yards of concrete will be used in its construction and that it is considerably larger than the Roosevelt Dam in Arizona. The reservoir formed by this dam will have an average depth of over 100 feet. The area of the surface is 10,500,769 square yards. The water from this reservoir will be carried about 20 miles by canals and will then flow through a tunnel of 1,486 yards above the Noguera-Pallaresa River, where a fall of 443 feet will be obtained. It is expected that this plant will be in operaton toward the latter part of 1914.

The construction of the canal and reservoirs for the Seros plant involves the building of seven dams containing about 900,000 cubic yards of earth. The canal work involves about 1,308,000 cubic yards of excavation. Work on this canal was commenced October 1, 1912, and is about two-thirds completed.

Construction of the plant on the Terradets involves 15.84 miles of canal, seven tunnels with a total length of 5,500 yards, five siphons with a total length of 1,230 yards, 12 aqueducts, 17 culverts, two main road crossings, and 27 small road crossings.

The company is constructing transmission and distribution lines to distribute electric power in Barcelona and vicinity, including all important points in the Provinces of Lerida and Tarragona, and already has contracts covering the supply for power and lighting purposes of 90,000 horsepower, and in addition a contract for the supply of a very large amount of power for the manufacture of nitrate in Lerida.

Of special interest to Americans is the fact that the company has already imported upwards of $3,000,000 worth of American machinery and appliances to be used in the construction of the works. It will also import large amounts of machinery, rolling stock, and other goods which will be required for other enterprises which it has taken over, including the gas works of Tarragona, the electric-light plants of Mataro, Tarrasa, Valls, Mollet, Catalana, and Reus, and the tram line from Barcelona to Sarria. This line is now in operation from the Plaza de Cataluna, which is in the center of the city, to Sarria. From that place it will be carried through a tunnel, 1,749 yards in length, now in course of construction and nearly completed, to the plains of Vallvidrera and Sabadell, thus bringing these outlying towns within 40 minutes' ride of the center of the city of Barcelona. When completed, this line will be equipped with modern and up-to-date American cars, the first of which, made by the Brill Company, of Philadelphia, have already been received.

In addition to the foregoing, the company has purchased 40 per cent of the shares of the Barcelona Tramways Company and has leased the entire system for a period of 60 years. It has also purchased 49 per cent of the shares of the Energía Eléctrica de Cataluña, which has constructed a large steam-power station and is building a hydraulic plant on the Flamisell River in the Pyrenees.

These vast undertakings will be of incalculable importance to the Catalan industries, bringing, as they will, electric power to the large number of factories located throughout the district, which have heretofore depended on coal for their power. Coal is very expensive in Spain and in some instances has to be hauled over 50 miles of poor wagon road to the factory. Practically all the factories in the district have entered into contracts with the company for the supply of electricity for power and light.

Over 9,000 laborers are now employed on the works in and around Lerida, Tremp, and San Antonio, where the great dam and canal and power houses are being built. The rapidity with which construction has gone forward has been a revelation to all who have seen what has been accomplished. An instance of the energy with which this company is working is the construction of a wagon road from Tremp to the camp at San Antonio, which had to be built to carry the machinery and material necessary for the construction of the great dam. This road covers a distance of 31 miles and twice crosses the Noguera-Pallaresa River, over which two steel bridges had to be thrown. The contract for the construction of this road had already been given by the National Government to another company, which under the terms of the contract had three years to complete the work. The Americans took over the contract from the original company and completed the road in five months, and it is now one of the finest roads in the country.

Periodicity of Terrestrial Magnetic Disturbances.

In a paper recently presented in London before the Royal Society it is pointed out by Dr. Chree that investigations extending over many years confirm the belief that there is a fairly definite period between the recurrence of successive magnetic storms or disturbances and other terrestrial magnetic phenomena. This seems to be between 27 and 28 days.

A FAIR FIELD FOR A BROADER MARKET.

By Ernest Freeman.

Team work wins, whether the game be baseball or business, and the larger the ratio of team work the happier and more profitable will be the results to both the team and the individuals on it.

The Society for Electrical Development exemplifies to my mind the ideal of team work for the development of the electrical industry—and for the immediate and ultimate profit of all engaged.

The very broadness of the plan makes it perhaps difficult—for one who has not been gifted with what might be called "a national vision"—to grasp just how the individual smaller interest will secure a direct profit from the work. That is, until the whole scope of the various plans are considered—then it is very clearly to be seen where the dotted line works directly into one's own profit sheet.

It's a good deal like the feeling connected with the winning of a team cup. We have a sort of feeling of pride in being on the team—it's a fine thing to see the cup on the club's mantle—but somehow each member would rather have received a smaller individual cup for his own individual sideboard.

The "personal sideboard" and its relation to the work of the Society is what we as individual contracting concerns must consider.

The complete plans of the Society have been published—we as contractors believe that the work will be of direct benefit to the industry and to us individually as contractors, and beyond the national advertising, the publicity work in newspapers, magazines, the moving picture, electric sign exchange and other ways as planned, and in the field work, do we see a certain and direct individual profit very much in excess of the relatively small proportionate share which we are subscribing to the movement. Beyond all this we have a vision—a vision of harmony in its highest form.

Harmony as we see it is a distinctly practical business proposition, to not only ourselves, but to the central station, the jobber and the manufacturer, who go to make up the industry in which we are all doing a distinctly related business.

"Related" we say, but there is case after case where the relations are strained—strained to a point where it is the belief of all that the sale of sockets, wire, conduit, lamps, motors, fans, irons and all classes of supplies and appliances, and of electric current, is being actually hindered; hence the friction between the various interests is of immense loss to us all. And this friction is chiefly caused by lack of understanding of each other, and perhaps lack of perspicuity in merchandising.

It seems logical to believe that the more live people or concerns there are pushing electrical goods, the more electrical business will be done.

We all know that in the cities where there is harmony there is the constructive development of the industry at its greatest to the mutual profit of all concerned.

What will The Society for Electrical Development do to help?

The answer lies in three brief paragraphs quoted from the Society's booklet, "What Does The Society for Electrical Development Mean to Me," and if the Society would do nothing further for the industry than to accomplish the purpose thus set forth, it will have more than earned the subscription of not only the contractors, but of the central stations, jobbers and manufacturers.

"Reducing Friction: Promoting Harmony."

"In cities where the central-station policy is not to the contractors' interest, the natural result is that the contractors retaliate. This means energy spent not in building up the electrical industry but wasted in competition. Where the contractors maintain prices at too high a level, the development of the industry halts, and the central station quite naturally retaliates by going into the wiring business. This again means energy misapplied in competition.

"One of the proposed services of the Society will be to co-operate in promoting harmonious local relationships. It is our belief, founded upon the experience of many cities that the bringing together of local interests on a common live-and-let-live basis stimulates the business for all. Prices are fair. Energy and money are not wasted in business warfare, but are used in business development. More houses are wired; more material is used in consequence; more appliances are sold; and more current is sold to operate them.

"This harmonizing of local conditions is a delicate work, requiring tact and experience. It seldom can be done by local interests, but The Society for Electrical Development can do it—will do it in your city if you as a member desire this service."

It will take time but we have the time. It will take money, but we can well afford the money; for the carefully graded subscriptions by which the funds are created for the various work, are a very small proportion of what it will mean to us all to accomplish the purposes of what is probably the greatest and most far-sighted mutual co-operative effort which has ever been developed in any known industry.

Huge Electrically Operated Freight Clearing House Proposed for London.

It is proposed by the New Transport Company, Limited, of London, England, to build a large central clearing house for incoming and outgoing railway freight at Clerkenwell in London. This is to be connected to all of the 11 railway systems and replace the 74 freight stations now scattered over the city. The clearing house is to cover an area of 30 acres and will be eight stories in height. The railway trains will be brought in below street level and will be disposed on 24 tracks in the basement. A large number of electric elevators, traveling cranes, conveyors, "trackers," etc., will handle the freight in bulk by wagonloads and sort it for distribution. It is claimed that the proposed clearing house will be able to handle the freight of 320 trains now entering London daily and dispense with the 700 inter-freight-station trains now required to distribute the freight from one station to another.

Water Power Commission for Massachusetts.

By resolution of the last Legislature of Massachusetts the chairman of the Harbor and Land Commissioners, the chairman of the Gas and Electric Light Commission and the Attorney-General are created a Commission to investigate and report to the Legislature of 1914 on the subject of legislation to conserve the waters and provide for the utilization and equalization of the flow of rivers and streams in the State. Hearings will be held, at which parties interested in hydroelectric development will probably appear. The Commission is authorized to employ engineers and is required to submit recommendations for new legislation on the subject. Five thousand dollars are at the Commission's disposal.

On account of the variety of supply voltages used in England (in Greater London alone there are 30 central-station companies supplying current varying from 100 to 240 volts) the most popular electric flatirons are provided with several terminal posts, manipulation of the connections to which adapts the iron to almost any desired voltage.

Several manufacturers of electric fans announce that the continued high heat this summer has created the greatest demand for fans they have ever experienced.

The Illumination of Schools and Libraries.

Two years ago a joint committee of illuminating engineering experts and educational and medical authorities was appointed in England to investigate the artificial lighting of schools. Facilities were granted by the London Education Department for experiments and observations to be made respecting gas and electric lighting in several of its school-rooms. The conclusions so far reached by the committee are embodied in a preliminary report which has just been published by the Illuminating Engineering Society in England.

The terms of reference included both daylight and artificial lighting but the latter was to be first dealt with.

The report first remarks that the intensity of illumination necessary in school-rooms depends on the nature of the work to be done, and a distinction may be drawn between the needs of children and those of adults. The needs of the children were chiefly considered, and as a result of the experiments it is suggested that

(a) For ordinary clerical work (reading, writing, etc.), the minimum illumination measured at any desk where the light is required should not fall below two foot-candles. (Four members of the committee favored a minimum of 2.5 foot-candles.)

(b) For special work (art classes, drawing offices, workshops, and stitching with dark materials, etc.), a minimum of four foot-candles is desirable.

(c) For assembly rooms, etc., and for general illumination there should be a minimum of one foot-candle measured on a horizontal plane 3 feet 3 inches from the floor.

The question of the permissible diversity-factor remains to be considered.

In regard to needlework only coarse work on white material should be executed by artificial light in schools, the minimum in this case being the same as for (a).

The respective merits of direct, indirect and semi-direct lighting were all investigated but the above standards of illumination were provisionally adopted irrespective of method.

Some attention was given to the question of blackboard lighting. Whereas the minimum illumination suggested for reading purposes (two foot-candles) might be enough in the case of a small class room where white chalk is mainly used and students are no further than 20 feet from the blackboard, a higher value would in general be necessary in the case of larger rooms, and on boards where it is customary to use diagrams in colored chalk. As a result of its experiments the committee recommends that an illumination on the blackboard, about 60 per cent in excess of that prevailing in the rest of the room is desirable. As a rule blackboard illumination should be carried out by special local lighting from lamps equipped with opaque screens, completely concealing them from the eyes of the students. The surface of the blackboard should be maintained a dead black sensibly free from regular or specular reflection, so that the maximum contrast between the white chalk and the blackboard may be available, and that there may be no glare due to reflection from polished surfaces.

The avoidance of glare is important and the value of proper methods of shading is emphasized. It is a common defect in school-rooms for the bare mantles or filaments to be within the range of vision when looking at the blackboard. The committee says that no lamps should come within the solid angle subtended at the eye by the blackboard and a space two feet above it unless they are completely screened from the eye by a shade impervious to light. In general, no incandescent surface should be visible to the eyes of students or teachers while doing their ordinary work. Another source of glare is the direct reflection of light from the polished surfaces of desks or paper. The committee advocates the use of shades in which the brightness of the source is spread out over a considerable area, and the judicious use of reflection from walls and ceilings. Lights in class rooms should be so arranged that inconvenient shadows cast by the body on the desk are as far as possible avoided.

The foregoing are some tentative suggestions preliminary to more detailed investigations and recommendations.

A similar committee of representatives from the Illuminating Engineering Society and from the Library Association, has also been deliberating for the last two years on the question of the artificial lighting of libraries. So far, it has considered only the question of artificial lighting and it now gives an interim report recognizing that the developments that are constantly taking place in the methods of illumination, and the necessity for fuller information as to their respective merits, make it undesirable to report definitely on many points. The amount of illumination required was first considered, and while it is recognized that a distinction should be drawn between the conditions requisite for various classes of libraries, experience of the conditions met with in a large number of London libraries justifies the following tentative recommendations:

(1) *For table, desk or newspaper-stand lighting,* the illumination where the light is being used should in no case be less than two foot-candles. This value is understood to apply reading ordinary type print on white paper. When books printed in small type or manuscripts or surfaces having a low reflecting power are to be studied, a higher illumination is necessary and a tentative value of not less than five foot-candles is suggested.

(2) *For book-case and shelf lighting* a minimum vertical illumination on the case or shelf of one-half foot-candle.

(3) *For general illumination* the minimum should be one-half foot-candle.

Local illumination should be measured on the desk slope or table where reading is done. Measurements of general illumination should be made on a horizontal surface 3 feet 3 inches above the floor. In all cases the illumination should be expressed in foot-candles.

The committee lays stress upon the importance of the avoidance of glare, reflection from the surface of papers or tables, and of shadows. It is held that while local and general lighting have both their respective merits, in general a combination of both is advantageous. The comparative advantage of direct, indirect, and semi-indirect lighting, as well as the best means of illuminating racks and shelves, are under further investigation.

Marconi Contract Ratified by British Parliament.

The House of Commons on Friday, August 8, ratified the contract of the British Government with the Marconi Company for the construction of an imperial chain of wireless stations. In essentials it is the same contract as that which, owing to certain misunderstandings, plunged England into a maze of difficulty and obstruction quite recently.

The confirmation of the contract between Marconi and the British Government follows a year and a half of delay and scandal involving members of the Asquith Cabinet, who were finally exonerated.

The contract, which was announced in March, 1912, was intended to secure a system of direct communication between Great Britain and all her possessions, known as the Imperial All-Red System. The first stations were to be built in London, Egypt, Aden, Bangalore, Pretoria, and Singapore. One of the reasons for the chain of stations throughout the British Empire was the alleged Americanization of the cable lines.

Under the contract the company was to receive $300,000 for each station, exclusive of the site and building, and also 10 per cent of the gross receipts for a term of twenty-eight years.

While the contract was pending it was attacked in several publications and charges were made that David Lloyd George, Chancellor of the Exchequer, and Sir Rufus Isaacs, Attorney-General, had speculated in Mar-

coni stock, which had advanced greatly on the announcement of the contract. A Parliamentary investigation was ordered, and it was found that the stock bought by the Cabinet members was that of the American Marconi Company, which could not profit by the British company's contract.

On June 20, 1913, the officials were vindicated by vote of Parliament. In the meantime an inquiry was also made into the mechanical side of wireless systems, with the result that the Marconi system was found to be the best.

The Marconi Company became restless at the long delay, as materials were advancing in cost, and it had a large sum tied up in a guaranty fund. It asked to be released from the original contract, but the Post Office Department demurred. After taking legal advice Postmaster Samuels learned that the contract was not binding upon the company, as it had not been ratified by the House of Commons, and that there was no way to hold the company to it. It was therefore ended on July 2 of this year.

Three days later Postmaster-General Samuels supplied the House of Commons with particulars of the new Marconi contract. By its terms the company demanded an increase of $32,500 per station over the price agreed upon in the original contract. On the royalty the company refused to make any deduction, asserting that the erection of the station left it no surplus, and that its profit was dependent upon the royalty alone.

Decorations for Potlatch Festival.

Golden Potlatch Festival.

One of the most beautifully decorated buildings in the city of Seattle, Wash., during the annual "Golden Potlatch" held July 16 to 19 inclusive was that of the Standard Furniture Company.

The accompanying illustration shows very distinctly the electrical features which were used to good advantage in the general scheme of beautifying.

The spectacular decorative feature is the enormous windmill, electrically operated, which covered the entrance of the structure. Various colored electric lights adorned the wings and when the mill was in motion a pleasing sight was presented to the onlooker. A large American flag, composed of colored lamps, which flashed at regular intervals, was shown above the mill. Four huge Potlatch bugs, the largest on exhibition and outlined with tungsten lamps, adorned the four corners of the unique decoration.

Directly over the entrance was a large electric sign with the characteristic welcome in Chinook jargon: "Kla How Ya! Kopa Konoway Tilikums, Kopa Potlatch," meaning "How are you! Welcome to our Potlatch, friends."

The Dutch windmill, the most prominent feature of the decoration, was 30 feet in height, had a 17-foot spread and was covered with 300 four-candlepower carbon lamps. A one-horsepower motor running at 2,200 revolutions per minute operated the mill at the rate of 10 revolutions per minute. The entire weight was 1,100 pounds.

The Standard Furniture Company received the award of First Prize for the best decorated building during the Potlatch events.

Restoring Old Cars to Use.

The Louisville & Northern Railway & Lighting Company and the Louisville & Southern Indiana Traction Company, which are controlled by the Middle West Utilities Company, of Chicago, and have their headquarters at New Albany, Ind., have been restoring to use cars which have reached the scrapping stage by means of a plan originated by H. H. Buckman, master mechanic. A steel underframing is provided, for the purpose of taking care of the train line strain. The body is then anchored to the underframe and steel sheets are bolted to the wooden body, replacing poplar panels which have been used heretofore. The result is a strong and substantial car, which resists wear and tear, prevents many accidents and is economical in paint consumption.

Increasing Use of Coal-Mining Machinery in Pennsylvania.

In reporting on the production of coal in Pennsylvania in 1912, the United States Geological Survey *Press Bulletin* says of this leading coal-producing state, that no less notable than the increase in production in 1912 was the extension of the use of mining machinery and the larger tonnage of machine-won coal. In 1911 the quantity of coal mined by machines was 69,131,923 short tons, or 47.78 per cent of the total; in 1912 the quantity so mined was 82,192,042 tons, or 50.8 per cent of the total. The number of machines in use in 1912 was 6,176, against 5,719 in 1911. The bulk of this machinery is electrically driven.

Fires in English Power Stations.

For several years preceding 1912 there were no serious fires in public supply generating stations in England, but last year there were three, and in his annual report to the Home Office Department, G. Scott Ram, government electrical inspector, says that these afford object lessons of great importance. In all three cases it was the covering of the cables that burned and spread the fire and, although some of the cables were in so-called fireproof composition tubes, these were of little, if any, use in checking the spread of the fire.

One of the fires occurred in a high-tension station where a new high-tension switchboard had just been completed. It originated under the floor of the working platform, and was apparently caused by the breakdown of the insulation in a joint box in which a concentric cable from a turbo-alternator was split up into two single cables passing on to the switchboard. The arc was maintained for some minutes before the plant could be shut down. Owing to its position and resulting fire, it was impossible to get immediately to the control board, and the fire quickly assumed large proportions, damaging considerably the control part of the new switchboard, the fire following the run of the cables. The supply of electrical energy was completely shut off for one night, but the duration of the stoppage would have been much shorter had not water got on to one section of the high-tension switchgear (part of the old board) necessitating a complete drying out before restarting. The fire was not due to any fault in switchboard design. Incidentally the occurrence showed the value of teak as a material for switch-room floors. The floor, which was of this material, although burned away where the arcing occurred, was at a short distance away practically undamaged, and did not lead to an extension of the fire. As the joint box at which it was supposed the breakdoown originated had been tested a few days previously, to three times the working pressure, the cause of the breakdown is unexplained.

The second fire occurred in a direct-current station giving a three-wire supply and a supply for traction. It originated below the switchboard gallery where the cables emerge from the cable trench and rise up the wall to the switchboard, and where the shunt regulators were placed. Precisely where the fire originated is unknown, but it quickly spread amongst the cables and, following them up through the space between the switch-gallery floor and the wall, practically destroyed the main three-wire switchboard on the gallery. In this case, the arrangement of the cables and wires below the switchboard platform was very crowded, owing to the growth of the station since the supply was first commenced some 12 years earlier, and gave little chance for saving the situation in the event of a fire once starting. There was a total cessation of supply in this case also.

The third case mentioned by Mr. Ram is one where fire appeared to be primarily due to a man working at the back of a traction switchboard making a short-circuit to the grounded metal framework. The switchboard was in a room adjoining the engine room and on a higher level, and on the opposite side of the room was the three-wire general supply switchboard. The man was severely burned by the resulting arc and the coverings of adjacent cables caught fire. This fire was put out by the staff with chemical extinguishers. A few minutes afterwards, an alarm was given that smoke was coming up from the basement—two floors below—where the cables from the generating plant and the feeders passed through to the switchboards and to the street. It was found impossible to enter the basement. The fire followed along the cables leading up to the switch room, passing through the space between the floors and the walls left open for their accommodation, and completely destroyed both the traction and the general supply switchboards. The latter had only just been installed at a cost of some thousands of pounds; it had nothing of an inflammable nature about it, the fire feeding entirely on the insulating coverings of the cables. A battery was connected to the traction board and no doubt contributed to the spread of the fire, as it was subsequently found to be completely discharged. The rate of discharge of the battery appears, however, not to have greatly exceeded the normal maximum rate of discharge, as the main circuit-breaker, which was on another switchboard and was found to be in order, had not come out. Mr. Ram remarks that how the fire amongst the cables in the basement started is not apparent, but he thinks that it may have been due to breakdown of insulation owing to momentary rise of pressure following on the original short-circuit at the traction switchboard. The complete breakdown in this case was more serious, for a number of works were dependent on the station for their power supply.

A fourth case, since the date of the report, has further clearly demonstrated that where the cables are in a covered trench or under a ceiling or roof, they are most readily attacked. The cables were in a subway some six or seven feet in height and were laid on insulators on racks on each side of the gangway. All the cables within about two feet of the roof of the subway had their insulation completely burned off, but those nearer the ground were practically undamaged. Mr. Ram says that in many of the older stations in England the cables and wires behind the switchboards and in cable trenches and subways are hopelessly mixed up so that should a fire be started at any point it would be impossible to prevent it from rapidly spreading and involving the whole plant. "It is a common practice in electrical stations for the cables to be taken from trenches or subways up the wall of the building to the switchboard gallery, the floor of the gallery being cut away, leaving a permanent opening some 12 inches wide all along for the cables to pass through. Two of these fires show the danger of this opening in the floor by allowing the fire to pass upwards involving the switchboards in the gallery or room above. So long as cables with inflammable insulation are used in electrical stations, it is obvious that some safer system of isolating and protecting them is necessary. * * * There are no doubt difficulties in many stations on account of the large number of cables which have to be accommodated, but it might be practicable in many cases to separate the cables in channels of brick or stoneware in such a way as would prevent the spreading of a fire from cable to cable. The small wires for instruments, regulating resistances, etc., are often a source of danger, being poorly insulated and looped about anyhow at the backs of the switchboards." The inspector adds that though it is generally recognized that inflammable woodwork, particularly soft wood, should not enter into the construction of switchboards, he recently found a new high-tension three-phase switchboard in a public supply generating station practically inclosed in woodwork; the busbars were just below a matchboard ceiling, and the whole passageway at the back of the open-fronted cells was inclosed by boarding.

Market for Domestic Electrical Appliances in Germany.

According to United States Consul R. P. Skinner, of Hamburg, the market for electrical appliances in Germany, although quite well supplied by local manufacturers, is capable of some development by American producers, particularly of vacuum cleaners and washing machines of moderate price.

Electrical Accidents in Great Britain

The following figures are extracted from the report of British Home Office Electrical Inspector G. S. Ram:

Electrical Accidents in Generating and Substations in 1912:

At switchboards when engaged in ordinary routine work	13
Cleaning, repairing or other handling of switchboards supposed to be "dead"	7
Cleaning, repairing, etc., at "live" switchboards or conductors (3 fatal)	33
Adjusting brushes and cleaning commutators, and flashing at commutators	11
Miscellaneous (1 fatal)	10
Total (4 fatal)	74
The non-electrical accidents numbered (11 fatal)	371

Electrical Accidents in Factories other than Electrical Stations in 1912:

Arcing of switches	23
Arcing of fuses	8
Shocks or burns from fuses when replacing fuse wires	27
Portable apparatus, connectors and flexibles	61
Unprotected conductors, switches, terminals, fuses, etc. (1 fatal)	27
Working on or near "live" conductors: Skilled persons, 32; unskilled, 33 (5 fatal)	65
Miscellaneous accidents in electrical manufacturing works, etc. (chiefly testing)	32
Adjusting brushes and cleaning commutators, and flashing at commutators	9
Miscellaneous (9 fatal)	31
Total (15 fatal)	283

It seems that artificial respiration was resorted to in less than 50 per cent of the fatal cases, and even when it was tried the duration of effort varied from fifteen minutes to two hours. The view of Dr. Reginald Morton that it must be persevered with for *at least* two hours is quoted approvingly, with the added comment that "some medical men, at all events do not recognize the importance of the practice, nor of the fact that electric "death" may be only apparent. In one case after a doctor had pronounced life extinct, the victim's friends resumed their artificial respiration efforts and brought him round!

The government inspector at Glasgow, who has visited many electrical stations, says that "apart from fatalities, accidents from shock, unaccompanied by serious burning, are often not reportable. I heard of more than half-a-dozen in the course of the year which had been sufficiently serious to cause unconsciousness of half an hour and upwards, but in each case the person, after regaining consciousness, resumed work in a few hours It is noteworthy, however, that such accidents narrowly miss proving fatal. In the general administration of the electrical regulations the chief difficulty is the technical ignorance of the users and the time consumed in necessary explanation."

The Proper Lamp for a Circuit.

A visual demonstration usually makes a greater impression upon the mind than a mere statement of fact and the accompanying illustration shows how the Engineering Department of the National Electric Lamp Association, in its exhibit at the recent annual convention of the National Electric Light Association, impressed upon the minds of observers the necessity for choosing incandescent lamps which are suited to the circuit upon which they are to operate.

Attention has frequently been called to the fact that when the voltage rating of a lamp is higher than that of the circuit, a customer does not receive the full amount of light which is expected and does not operate his lamp under the condition of maximum economy; whereas,

THE PROPER LAMP FOR A CIRCUIT
REVENUE AND LIGHT OBTAINED FROM 110-VOLT MAZDA LAMPS AT VARIOUS LINE VOLTAGES
PER CENT REVENUE TO CENTRAL STATION
98c DOLLAR
40 WATT MAZDA LAMP CONSUMER BUYS LAMP

Interesting Lamp Exhibit.

on the other hand, the central station does not derive as much revenue from the load as it should. If the lamp rating is too low for the circuit, the life will be greatly reduced and again the lamp will not be burned under the condition of maximum economy. The frequency of burnouts is likely also to produce dissatisfaction in the mind of the user.

In the exhibit above mentioned three meters were arranged upon a panel to illustrate these conditions. These meters consisted of pointers moving over dials, but contained no internal parts. The three pointers were so geared together back of the board, however, as to move in unison and indicate values which would occur simultaneously in actual practice. The pointers were moved by means of a handle as seen in the lower part of the illustration. By means of this handle the pointer on the lower dial could be set at any desired voltage, which would then represent the voltage of the circuit to which a 110-volt lamp was connected. The upper left-hand meter indicated at the same time the revenue which would accrue to the central station by burning the lamp at this voltage, expressed in per cent of the revenue obtained when burned at 110 volts. The upper right-hand meter indicated the relative amount of light obtained for $1.00 from a 40-watt lamp, where both the cost of renewals and the cost of energy were included.

While the revenue to the central station increases or decreases continuously in harmony with the voltage, it is found that the amount of light received runs up with increasing voltage to a maximum and then decreases again, showing that the greatest economy is secured only when operating at the proper voltage, namely, the voltage at which the lamp is rated.

This exhibit was an impressive demonstration of the folly of operating lamps with too high a voltage rating upon a given circuit.

United Railways, St. Louis, Operating with Keokuk Power.

On July 29 the United Railways Company, St. Louis, Mo., transferred about one-half of its entire load from its own steam stations to the hydroelectric plant of the Mississippi River Power Company at Keokuk, Ia. The Union Electric Company, also of St. Louis, has a contract with the United Railways whereby it supplies a maximum of 25,000 kilowatts, which is being supplied to it in turn by the Mississippi River Power Company. The final transfer of the railway load from the two steam generating stations, namely, the Central and North Broadway, totals at this time between 20,000 and 21,000 kilowatts during the morning and evening peaks.

For the present, at least, both the Central and North Broadway power stations will be held in reserve with 17 boilers banked in the former and 15 in the latter and the Central power station will supply 5,000 kilowatts during the evening peak and the Broadway station will supply 4,000 kilowatts. As soon as the reliability of the hydroelectric service is established, the company will bank only a sufficient number of boilers in the two steam stations to supply 8,000 kilowatts during the morning and evening peaks, 5,000 kilowatts at one station and 3,000 kilowatts at the other. The contract for power with the Union Electric Company, St. Louis, is about to expire, and this 25,000-kilowatt additional load will be transferred to the Mississippi River Power Company in the near future, which will make the total maximum contracted load carried to the United Railways 47,400 kilowatts.

It is anticipated that the transfer in the power load from the United Railway's generating stations to the Mississippi River Power Company will result in a saving of approximately three-fourths of the coal bill.

BOOK REVIEWS.

"Common-Battery Telephony Simplified." By Walter Atkins. New York: The D. Van Nostrand Company. Cloth, 164 pages (5x7¼ inches), illustrated. Supplied by the Electrical Review Publishing Company for $1.25.

This little volume contains a large number of diagrams of connections showing the use of the common-battery system in telephone work. The entire details of commercial apparatus are not introduced, but sufficient is given to show the principles upon which operation is based. This enables the diagrams to be made as simple as possible. The volume will be found very useful to those not actually engaged in telephone work who wish to become familiar with the general methods employed in this rapidly developing subject. The book is well written and well printed.

"The D'Este Steam Engineers' Manual," with Electrical Appendix by Charles Penrose. Second edition. Boston: Julian D'Este Company. Flexible leather, 484 pages (4¾x7 inches), illustrated. Supplied by the Electrical Review Publishing Company for $2.00.

This handbook exemplifies the old saying about the tail wagging the dog, as the electrical appendix comprises about three-fourths of the entire volume. This appendix is written from the standpoint of the stream engineer, although some of the subjects introduced are not especially in his line, such as photometry. The measurement of temperature by electrical means receives more extended treatment than usually would be expected in a work of this kind. There are a large number of illustrations of machines of various kinds illustrating the well known types, but these are accompanied by very little reading matter. Perhaps the best thing in the volume is the chapter giving a synopsis of the electrical equipment of an alternating-current generating station, and this should prove useful to many. While from this standpoint the volume is modern, the introductory matter can hardly be said to be up to date.

"Manual of Wireless Telegraphy and Telephony." By A. Frederick Collins. Third edition, revised and enlarged. New York: John Wiley and Sons. Cloth, 300 pages (5x7½ inches), illustrated. Supplied by the Electrical Review Publishing Company for $1.50.

The new edition contains much material dealing with the progress in radiotelegraphy since the book was first written. Good descriptions are given of the principles involved and of the apparatus for sending and receiving, without the introduction of mathematical equations. The aerial system receives treatment in a separate chapter, and, in another, suggestions to operators are collected. The last chapter is devoted to wireless telephony. The appendices give a glossary of terms used in wireless work and a list of books on wireless telegraphy.

"Graphs in a Cable-Ship Drum-Room. Notes for Junior Assistants." By Edward Raymond-Baker. London: H. Alabaster, Gatehouse & Company. Linen, 46 pages (6½x10¾ inches), illustrated. Supplied by the Electrical Review Publishing Company for 75 cents.

This booklet is a reprint of articles originally published in the *Electrical Review*, of London, last January, with the addition of some tables, illustrations, etc. This portion of the work of cable laying is mechanical rather than electrical, and will be found of little interest except to those actually engaged in the work of cable laying. The assistants in the drum room, however, to whom it is dedicated, should find it extremely interesting and helpful, as the mechanical points involved in the operation of paying out cable are set down in a readily usable form. Outside of the tables and curves the illustrations are mainly those of general interest connected with the laying of some of the well known ocean cables.

"Dynamo Laboratory Outlines for Students in Electrical Engineering." By John Fay Wilson. New York: McGraw-Hill Book Company. Cloth, 130 pages (5½x8 inches), illustrated. Supplied by the Electrical Review Publishing Company for $1.00.

The author very properly has entitled this book "Dynamo Laboratory Outlines," the method of treatment being a brief statement of the object of the experiment, a list of the measurements to be made and a series of questions intended to draw the student's attention to the significance of his results. The theory of the test and a detailed description of the method of carrying it out are intentionally omitted, but to each experiment is appended a list of references. For the proper performance of the test previous consultation of these references is necessary and this training in looking up references is good, though some would probably think that time might be saved if a brief discussion of the matter were included in the text, particularly as it is to be used by undergraduates. The list of tests selected is good. These begin with the shunt generator, take up the series generator, compound generator, parallel operation and the different types of motors, tests for performance, efficiency and losses, magnetic tests, etc. On alternating currents the properties of the circuit are discussed, though perhaps a little too briefly. This is followed by performance tests on the different types of alternating-current machines, the alternator, the synchronous motor, the rotary converter, the induction motor, the induction generator, the commutating motor, transformers, rectifiers and wave-form tracing. The book should be very helpful to the student in the laboratory but must be supplemented by other laboratory manuals.

"Essentials of Electricity." By W. H. Timbie. New York: John Wiley & Sons. Cloth, 272 pages (5x7 inches), illustrated. Supplied by the Electrical Review Publishing Company for $1.25.

Professor Timbie's object in publishing this book was to supply a reliable text for students in a trade school. For such purposes no previous knowledge could be assumed; the author must begin at the beginning. Moreover, his explanations must be clear and definite and not too diffuse. The attention should be concentrated strictly on the subject in hand and any confusing side issue should be strictly avoided. In this Professor Timble has succeeded well. The presentations while necessarily elementary are none the less accurate and scientific. Due emphasis is given to the ideas of current and pressure and thus a sound foundation is laid for proper understanding of the functions and behavior of the many varied types of electrical apparatus. The first three chapters of the book are devoted to a thorough discussion of the electric circuit. Professor Timbie believes in the value of practical examples for making knowledge definite and provides these profusely. Chapter IV is devoted to a discussion of electric power and the relation between this and mechanical power and heat is duly emphasized. In chapter V is given a thorough discussion of the common systems of wiring. Chapter VI explains the different types of direct-current generators and motors and the principles upon which they depend for their operation. Auxiliary apparatus for controlling these is also described. Chapter VII deals with "troubles," Chapter VIII with batteries, Chapter IX with wiring diagrams, bells, annunciators, fire alarms, burglar alarms, gas-lighting systems, ignition, telephone, sign flashers and various other practical applications. The treatment throughout is quite similar to that in the author's previous volume "The Elements of Electricity." The illustrations are good and the diagrams in particular are clear and simple.

"Tables Annuelles Internationales de Constantes et Données Numériques de Chimie, de Physique et de Technologie." Vol. II for 1911. By the International Committee of the Seventh Congress of Applied Chemistry. Paris: Gauthier-Villars, and Chicago: University of Chicago Press. Cloth, 759 pages (8½x10½ inches). Supplied by the Electrical Review Publishing Company for $5.30 unbound or $6.00 bound.

The second volume of these tables is very similar to the first in makeup and

volume. The amount of research resulting in additions to our knowledge of the constants of materials is apparently about the same in 1911 as in the year 1910, which was covered by the first volume of tables. These yearly volumes of tables, each covering the research work of the world in this particular domain for the period of 12 months, form an invaluable acquisition to the seeker after original data, who would otherwise be required to search through many volumes of periodicals. The tables are published by a committee, of which C. Marie, of Paris, is general secretary. American periodicals are very ably covered by the American members of the committee and their assistants. These members are W. D. Bancroft, Edward C. Franklin, Gordon F. Hull, Gordon Gale, G. N. Lewis, Albert P. Mathews and Julius Stieglitz.

The table of contents is printed in four languages in parallel columns, the languages being French, German, English and Italian. The titles here are arranged according to subject matter. An alphabetical index would form a valuable addition to the volume, even though published in but one language. The tables are entirely in French. Reference to original publications is given in each case, so that the investigator who wants to inquire into the reliability of the results given, may easily find a description of the experiments.

"Revolving Vectors With Special Application to Alternating-Current Phenomena." By George W. Patterson. New York: The Macmillan Company. Cloth, 89 pages (5½x8¼ inches), 23 illustrations. Supplied by the Electrical Review Publishing Company for $1.00.

One ordinarily associates vector representation with the use of geometrical diagrams. The reader who takes up this volume with that point of view is likely to be disappointed, as geometrical representation is very much lacking and there are, all told, but 23 diagrams. The work is entirely mathematical and the contents would perhaps have been more appropriately designated "The Use of Complex Quantities in the Theory of Alternating Currents." The reader without mathematical preparation will not be able to follow this presentation, but for one who is properly prepared the book furnishes a concise justification for, and explanation of, the use of complex quantities in electrical problems. In places the treatment may be found too concise for the reader to whom the subject is new, as there is but little physical illustration of the equations derived. One slight error into which the author falls is the common one of referring to the resistance drop of voltage as "ohmic" drop.

United States Coal Production in 1912.

The production of coal in 1912 reached the great total of 534,466,580 short tons, valued at the mines at $695,606,071, according to a statement just issued by the United States Geological Survey.

In 1882 the total coal production of the United States had reached what was then considered about high-water mark—103,551,189 short tons. In 1912 the production of bituminous coal alone in the state of Pennsylvania exceeded that figure by nearly 60 per cent and the combined production of bituminous coal and anthracite in Pennsylvania in 1912 was 2.25 times the total production of the United States in 1882. The total coal production of the United States in 1912 was more than five times that of 1882. In 1882 the United States was second among the coal-producing countries of the world, Great Britain having an output exceeding that of this country by nearly 70 per cent. The United States supplanted Great Brittain as the premier coal-producing country in 1899, and in 1912 it was as far ahead of Great Britain as that country was ahead of the United States in 1882. The United States at present is contributing 40 per cent of the world's supply of coal and is consuming over 99 per cent of its own production.

In 1912 the production of coal in the United States not only surpassed all previous tonnage records, but the average value per ton exceeded that of any normal year in the 33 years for which statistics are available. There has been only one year when prices generally were higher than in 1912, and that was 1903, the year of the fuel famine.

The gain in output in 1912 over 1911 was 38,095,454 short tons and the increase in value was $69,040,860. The production of bituminous coal increased from 405,907,059 short tons to 450,104,982 tons, a gain of 44,197,923 tons, with an increase of $66,607,626 in value. The decreased production of anthracite, amounting to 6,102,469 short tons, was due entirely to the suspension of mining in April and May, when practically the entire region was idle. The factors which contributed to the increased output of bituminous coal were (1) the revival in the iron and steel industry, which stimulated production in the eastern states, the coal made into coke showing, alone, an increase of nearly 6,000,000 tons; (2) bumper crops of grain and other agricultural products, which gave prosperity to the farming communities of the Middle West; (3) decreasing supplies of natural gas and fuel oil in the mid-continent field and their consequent lessened competition with coal from the southwestern states; (4) increased consumption by railroads and nearly all lines of manufacturing; (5) activity in the mining and smelting of the precious and semiprecious metals in the Rocky Mountain and Pacific states. These factors combined made the year 1912 one of the rather rare prosperous years in the mining of bituminous coal.

Of the 27 states in which coal mining may be considered to be conducted on a commercial basis, there were 21 in which the output of 1912 showed an increase over 1911, and in all but two of the important states the increase in value was greater than the increase in tonnage.

In the production of bituminous coal Pennsylvania in 1912 showed an increase of 17,304,231 short tons. West Virginia's increase in 1912 was 6,955,107 tons. Illinois increased its production by 6,206,108 tons, Ohio by 3,768,741 tons, Kentucky by 2,440,818 tons, Indiana by 1,084,363 tons, Alabama by 1,079,179 tons, Virginia by 981,971 tons, Colorado by 820,441 tons, and Kansas by 807,454 tons.

Large Contract for California Company.

The board of trustees of Colton, Cal., have entered into a contract with the Southern California Edison Electric Company for the furnishing of electric energy to Colton for a period of ten years. On the ten-year term the city will pay nine cents per kilowatt-hour for the first 150,000 kilowatt-hours per month, and for all energy used in excess of this amount 7.5 per kilowatt-hour, the minimum annual consumption to be equivalent to $10,000. It is understood that in order to fulfil its contract the company will have to spend several thousand dollars in the enlarging and betterment of its local system.

Advertising That Appeals to Women.

The United Electric Light Company of Springfield, Mass., is utilizing a novel advertisement, which appeals principally to women consumers of electric energy. Under the headline "30,000 Stitches for One Cent" the company states that the G-E sewing machine outfit is the happy solution of the sewing problem in the home. The power for operating the sewing-machine is brought to the motor through a cord and plug that is attached to the electric light socket in a moment. The claim is made that the cost of the energy is but one cent for 100 yards of cloth sewed.

Colorado is the most important coal-producing State west of Mississippi River and ranks seventh among all the States. The coal mined in 1912 was 10,977,824 short tons, an increase of 820,441 tons over 1911.

New Electrical and Mechanical Appliances

Westinghouse Transformers for Manholes.

Manholes and underground chambers are usually damp and quite frequently are flooded, so that it often becomes necessary for the transformers to continue in service while partly or wholly submerged in water. A transformer for such service must therefore be watertight and airtight. The joints between the case and cover, as well as those where the leads issue from the case, must be of such a construction as to prevent any possibility of moisture entering the case. On account of the poor ventilation in manholes, and the resultant fairly high temperature, transformers must have low temperature rise. Also, due to the limited space available for installation and handling, they must be compact but at the same time rugged in design. Transformers used in such service are usually connected to the mains continuously, consequently it is essential that the iron loss be as low as possible, consistent with the other points of the design.

Fig 1. 75-Kilovolt-Ampere Manhole Transformer.

The new type SM transformers made by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., have been designed with these requirements in view. Up to and including 50 kilovolt-ampere capacity, type SM manhole transformers are similar in construction, with the exception of the case, outlet bushings, and low-tension terminals, to the well known Westinghouse type S transformers. These transformers are inclosed in cast-iron cases, the larger sizes of which are corrugated to facilitate the radiation of heat. The design of the 75 and 100-kilovolt-ampere transformers, illustrated in Figs. 1 and 2, is somewhat modified to enable the transformer to pass through the usual standard manholes. Transformers of these capacities are mounted in sheet-iron tanks welded by the oxy-acetylene blow-pipe process with the top and bottom castings cast on.

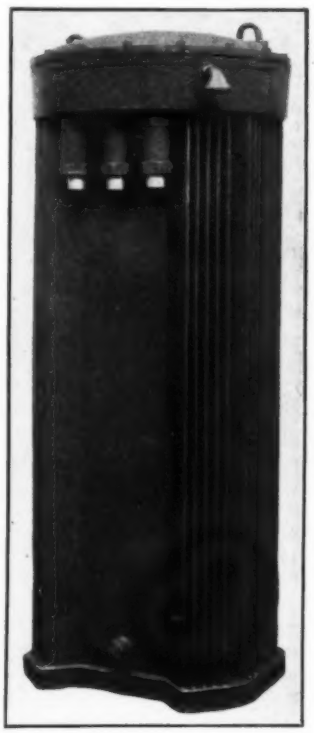


Fig 2. 100-Kilovolt-Ampere Manhole Transformer.

The joint between the cover and case is made perfectly waterproof and airtight by means of a wire gasket fitting snugly in a V-shaped groove in the case. This wire is a special alloy of tin and lead which has been found to give excellent results for this purpose. The cover is secured to the case by a number of bolts placed around the periphery of the case and, as these are tightened, the wire gasket is compressed and its shape is slightly changed so as to conform exactly to that of the groove; see Fig. 3. Sherardized bolts and nuts are used so as to prevent rusting of the nut and bolt together and resulting difficulty of removing the cover from the tank.

Since these transformers are made airtight, internal pressures are developed due to the expansion of the air and oil, caused by an increase in the temperature. The air space between the oil level and the cover, however, forms an effective cushion for taking care of the expansion of air and oil. A further precaution is usually provided by mounting on each transformer a safety device for relieving any abnormal increase in pressure. This device consists of a brass pipe casting screwed into the cover, over the outer end of which is soldered a thin sheet ot copper which will rupture if the pressure becomes excessive.

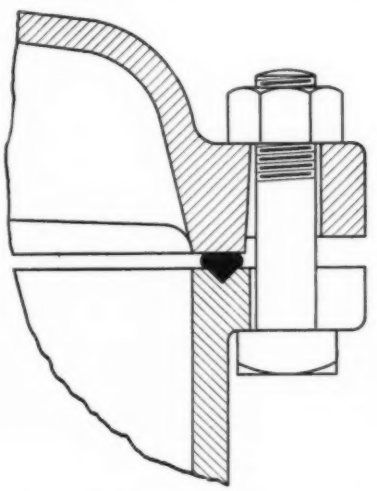


Fig. 3. Joint Between Transformer Cover and Case.

The bushings furnished with these transformers not only prevent moisture entering the case, but are so designed that it is possible to connect and disconnect the transformer very readily. As the space in the manhole is usually quite limited, this feature is of advantage.

This method of bringing out the leads from the transformer through the

outlet bushings is shown in detail in Fig. 4. The leads are brought from the coils through a heavy porcelain bushing and terminate in leaf connectors. Connection is made to the line by inserting the leaves of a similar connector to the lead-covered cable and tightening a bolt which is inserted in a hole passing through all the leaves. A brass sleeve with an insulating lining is slipped over the

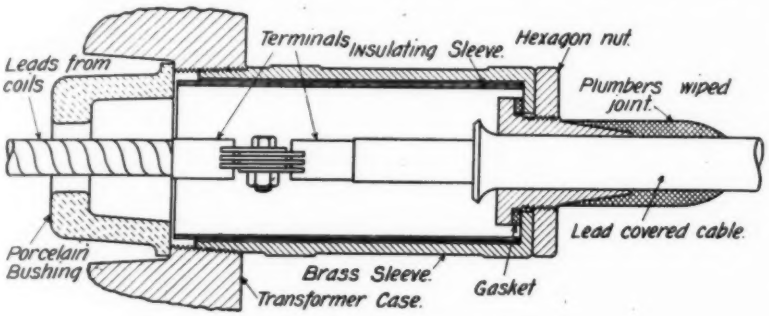


Fig. 4. Method of Connecting Leads.

connection and screwed into the transformer case. The lead sheath of the cable is connected to a flanged sleeve by a plumber's wiped joint. A nut is used to force this sleeve to a seat on the gasket in the outlet bushing, making a perfectly watertight joint. This construction affords a most satisfactory method of connection, enabling same to be made in the limited space of the manhole.

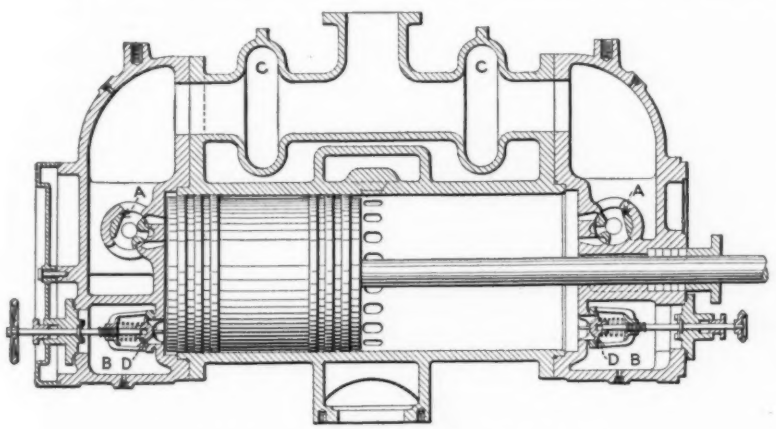
The low-tension leads are brought to four terminal studs. Connections for the different voltages are made by means of copper strips connecting these terminals, placing the coils in parallel or series as may be desired.

The Nordberg Uniflow Engine.

In steam engineering practice it has long been recognized that a considerable loss in the engine cylinder is caused by the initial condensation of considerable steam on admission to the cylinder. In the ordinary engine when the piston completes its stroke it has driven out the exhaust steam at the corresponding end of the cylinder, thereby reducing that end to the temperature of the exhaust. At the beginning of the return stroke the live steam then meets cooled walls and this produces the condensation referred to.

To overcome this difficulty there has been developed by Professor Stumph, of Germany, a type of engine in which the exhaust does not take place from near the ends of the cylinder, but from the middle, the result being always a flow of steam from the ends toward the middle and much more uniform temperature of the cylinder heads. For this reason this type of engine is known as the "Uniflow" engine.

The Nordberg Manufacturing Company, Milwaukee, Wis., has adapted this type of engine to the requirements of American practice by equipping it with a modified form of Corliss valve gear. Above is shown a section of the Nordberg Uniflow engine in which it will be seen that at the middle of the cylinder is a ring of exhaust ports which is uncovered by the piston at the end of the stroke so that the piston itself forms the exhaust valve. In each of the cylinder heads is a steam valve



Cross-Section of Nordberg Uniflow Engine Cylinder.

A. The space about these valves and also the clearance pockets *B* are filled with steam, thus making both the heads completely steam-jacketed. The piston face is exposed to exhaust temperature for only an instant at the end of its stroke. On the return stroke some exhausted steam remains trapped in the cylinder, and this is compressed between the piston and cylinder head, raising its temperature and pressure up to or above that of the live steam so that the latter after the opening of the steam valve meets no cool surfaces and therefore condensation is largely prevented.

In the steam chest, which is cast integral with the cylinder, are two drums *C* to take up expansion without distorting the cylinder. The steam valves *A* are of the Nordberg four-ported type giving large area of opening with that small movement of the valve. The valve gear is of improved design and contains many valuable features. At each end of the cylinder is a relief valve *D*, which serves both to relieve the engine of any entrained water and also to provide an increased clearance space if the vacuum should suddenly be lost while running condensing. If it is desired to operate noncondensing, these valves may be backed off their seats to increase the clearance until condensing operation is restored.

Among the advantages claimed by the manufacturers for the Nordberg Uniflow engine are (1) high steam economy due to practical elimination of initial cylinder condensation; (2) extraordinary capacity for overloads; (3) flat steam-consumption curve, that is, very small increase in steam consumption underload and overload; (4) high economy with moderate vacuum, resulting in a saving in both initial and operating costs of the condenser outfit. These claims have been borne out by prolonged tests.

Protective Equipment for 25,000-Kilowatt Turbogenerator.

The protective gear apparatus being built by A. Reyrolle & Company, of England, for the 25,000-kilowatt turbogenerator also being built in England for the Commonwealth Edison Company, Chicago, was recently described in *Electrical Review* of London. The system of protection adopted is the well known invention of Charles Merz and Bernard Price. The current transformers are inclosed in iron cases and are filled in solid with compound. Provision is made for a single-turn primary conductor, which will pass straight through the center of the core. Fuses are used for the purpose of providing a time-limit overload protection; these are connected in the main secondary circuit. Under ordinary circumstances

the fuses would be set to blow at a heavy current, so that they would only melt in the event of a persistent busbar fault. The relay is connected to the main secondary circuit across phases at points which are normally at equal potential, and it is set to release the switch for a fault to ground or between phases on the armature or on the connections between the machine and the current transformer, which is fixed on the switchboard. The operation of the relay is instantaneous; therefore, in the event of a fault between phases or to ground occurring, the generator will be cleared from the busbars, and the whole operation will take no more time than that required by the switch in moving the mass of its mechanical moving parts from the positions which correspond to the closed and open positions of the sparking contacts. This time lag is exceedingly small, and, in accordance with the experience obtained elsewhere on the Merz-Price protection, it is expected that a faulty machine will be cleared from the system without causing a dsiturbance to the sound running plant, other than throwing additional load on the sound generators.

Detroit Electric Makes Progress.

The Anderson Electric Car Company has purchased outright the entire rights to the Hanlon patent for electric car windows. This invention is one of the features of the 1914 models of Detroit Electrics. The well known clear-vision features of Detroit Electrics are improved upon by the new method, which adds to the safety as well as to the luxury of driving this car. The invention protects occupants of the car in undesirable weather, and at the same time enables the driver to see clearly ahead under all conditions. Adjustable from within, the operator may incline the front window at any angle desired, and in the event of snow, rain or heavy dust it may be closed from within in such a manner that the storm will not beat against the front glass. When closed in very cold weather it eliminates the formation of frost on the glass.

A Detroit Electric recently made a surprising run of 50 miles across country through one of the worst storms that has swept the District of Columbia for years. The run was made on one charge of battery and at the end of the ride there was sufficient current remaining to run 30 or 40 miles further. Bruce Emerson, Howard Fisk and the editor of the Washington *Times* drove a four-passenger Detroit Electric brougham out the Conduit Road from Washington to Great Falls, thence to Potomac, Md.; Rockville, Norbeck, Wheaton, Kensington and Chevy Chase. In many places the roads are under repair, necessitating detours over rough places. The storm struck the tourists when they were midway between Norbeck and Wheaton, on the Seventh Street pike. Falling trees stopped the progress of the machine and the motorists narrowly escaped injury when a large locust tree fell across the roadway just in front of the car. When the storm abated, Emerson and his passengers had to procure axes from farmhouses along the road to chop their way through the mass of trees that lay across the road for several miles.

In many places along the Seventh Street pike the motorists found all the telephone wires down, falling trees having pulled the wires from the poles. Evidences of the fury of the storm were seen by the tourists in all the suburbs adjacent to Washington between Norbeck and Chevy Chase.

Electric Railway Proposed for Bagdad.

Two English engineers have just arrived at Bagdad to survey three different lines for an electric railway from Moazzem, five miles north of Bagdad, to Garara, 5 or 6 miles south of Bagdad. It was reported in May, 1912, that a concession to build this line had been granted to Mahmoud Shabander, Bagdad, and that Mr. Shabander had left for Europe to contract for engineers and materials. It is now reported here that Mr. Shabander has sold his concession in whole or in part to an English firm and that actual construction will begin in the near future. The engineers are surveying two lines through the city of Bagdad and a third line just along the east border of the city. A fourth line will be surveyed along the west bank of the Tigris through west Bagdad. After the surveys have been completed the plans must be submitted to the imperial government at Constantinople for approval of the one or the other line or lines.

Ohio Breaks Coal Record.

The production of coal in Ohio in 1912 reached the record-breaking figure of 34,524,727 short tons, valued at the mines at $37,079,573, increases of 3,764,741 tons and $5,269,450 over the figures for 1911.

The Forbes Electric Water Sterilizer.

In the great advance made in recent years in preventive medicine and which has been manifected through the creation of public departments or boards of health, a line of considerable activity has been the warning of the public against danger from impure and contaminated drinking water. Epidemics of typhoid fever and other enteric disorders have emphasized the need of special means for rendering suspected water safe before use. Aside from various general means for making the entire water supply of a community reasonably safe, there have been urged additional precautions that may be taken by individuals or institutions; among these are the purchase of mineral water free from bacterial taint, purchase or preparation of distilled water, and the sterilization of the raw water by boiling before use.

Of these expedients, the use of mineral water is, of course, excellent; but for the general public the expense of mineral water makes it practically a prohibitory luxury. High cost is also a disadvantage of distilled water and besides it has been found by some investigators that the continued use of such water, due to the entire absence of mineral content, has a gradual debilitating or weakening action on the body, reducing the power of resistance and making one more prone to infectious diseases. Sterilization by boiling is probably the simplest and most easily applied means for making water safe and it is claimed to be the best.

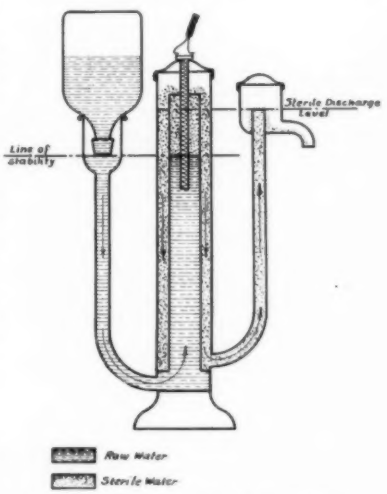


Fig. 1. Principle of Forbes Sterilizer.

That boiling destroys pathogenic or disease-producing bacteria is positively known; it is also known that it does not injure certain harmless and benign bacteria that are of value to the system. Since boiling is so readily carried out, it is the advice most commonly given the public, but the suggestion that it be continued for 20 minutes or more is merely to make it emphatic that actual lively application of heat is necessary. In fact, prolonged boiling is seldom followed out and is not desirable, since it increases the fuel cost and renders the water unpalatable by driving off all its contained gases. Moreover, many experts contend that actual sterilization is fully attained by merely raising the temperature of the water to nearly the boiling point, making sure that all of the

water actually attains the sterilizing temperature.

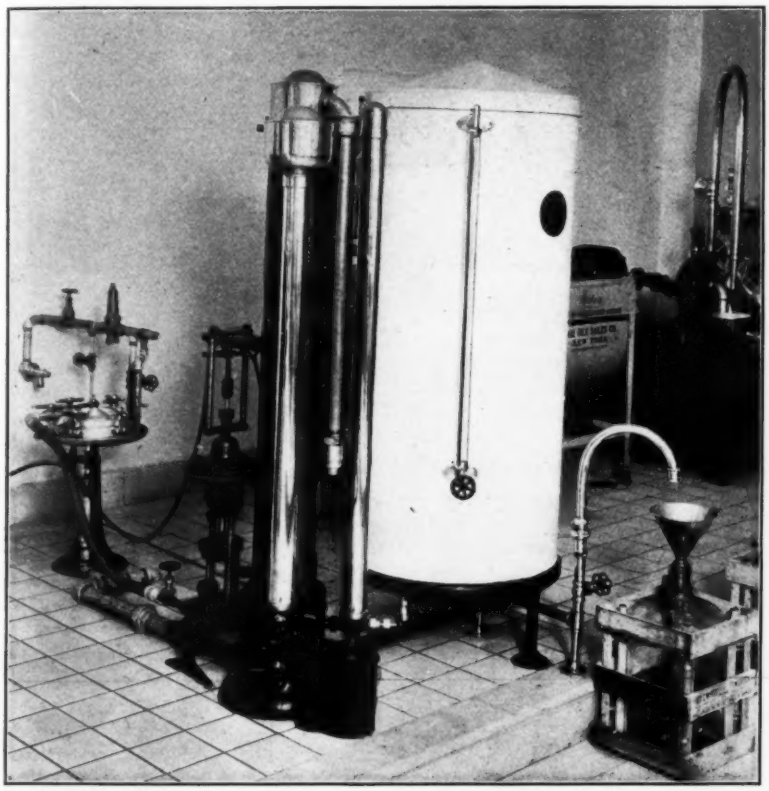
With the advantages that boiling possesses for rendering water sterile becoming more generally known, there has arisen a need for a practical sterilizing apparatus that will raise the water to the proper temperature without depriving it of valuable mineral or gas content. This need has been met by the Forbes Company, of 1234 Callowhill Street, Philadelphia, Pa., which some time ago developed a successful water sterilizer heated by gas. A similar outfit electrically heated has now been placed on the market.

The general principle of the Forbes sterilizer is made clear in the rough diagram shown in Fig. 1. There are three essential elements in the operation of the apparatus: (1) a source of raw-water supply having an open level below that necessary for its passage through the apparatus, (2) the application of heat to the water, at the point where it has stopped by gravity, until ebulition is produced, this causing it to rise above its normal level and so pass through the remainder of the apparatus; (3) the inter-change of heat from the hot outflowing water to the cold inflowing water. In Fig. 1 the raw-water supply is shown in the upper left-hand corner in the form of a bottle inverted over the inlet. The water passes from this into the middle tube, rising to what is marked as the "line of stability" level with the inlet. At the top of this middle tube the heat is applied by means of an electric resistance heating element, producing ebulition and consequent boiling over from the central tube into the surrounding jacket. The hot sterile water descends in this outer tube and gives up heat to the cold raw water rising in the inner tube. By this heat interchange two useful things are accomplished; the sterilized water is cooled and the raw water is given a preliminary heating, thus reducing the need of ice and at the same time increasing the efficiency of the outfit. In the small size sterilizers the efficiency of heat interchange is said to be about 91 per cent; in the larger sizes, ranging up to 500 gallons per hour; this efficiency rises to about 95 per cent. These figures are not the efficiency of the sterilizer outfit as a whole, however, since some heat is radiated from the walls and some lost in generation of a small volume of steam in connection with the boiling stage of the process.

The smaller sizes of Forbes sterilizers can be made up in connection with a sanitary water cooler. In this case the sterilizer is carried on a stand that also supports the cooler. A large glass storage vessel is provided for the sterile water directly over the cooler, through which it passes in a glass vessel of reduced size, so that a relatively small quantity of ice suffices for packing about this vessel in the cooler. This form of sterilizer requires only the invertion of a bottle of raw water over the inlet and the turning on of the current, the sterilizing action being entirely automatic. The water is not touched until it is drawn from the faucet in safe condition for drinking. It can not pass through the apparatus without being properly sterilized.

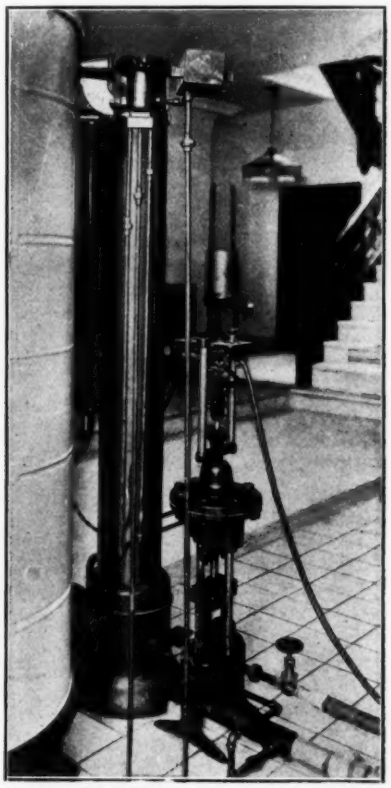
For large offices, clubs, hotels, schools, etc., larger sizes of the Forbes sterilizers are made; these naturally have refinements that make them still more automatic. A large Forbes electric apparatus is shown in Figs. 2 and 3. This was recently installed in the Forty-second Street display room of the New York Edison Company. In the middle of Fig. 3 can be seen an automatic switch that closes the heating circuit only when sterile water has been drawn. In these large sterilizers the heat-interchange part of the apparatus is subdivided into several pipes like a radiator so as to get a larger area for heat interchange.

Eight sizes of Forbes electric sterilizers are made. The smallest size has a capacity of two gallons per hour and takes 224 watts; the 100-gallon size takes 10.3 kilowatts; the largest or 500-gallon size takes 47.5 kilowatts. Thus the input of these three sizes amounts to 112, 103 and 95 watts per gallon, respectively. Other intermediate sizes take corresponding inputs.



New York Edison Photo

Fig. 2. Large Forbes Electric Sterilizer in New York Edison Display Room.



New York Edison Photo

Fig. 3. Automatic Control of Same.

Abesto Automatic Electric Flatiron.

The heating element in an electric flatiron is nearly always so proportioned that it will provide abundant heat for properly performing the most severe service, which is the ironing of thick or dense materials that hold a large amount of moisture. When ironing thin goods, however, such a supply of heat is excessve unless the iron is moved over the material with an extraordinary speed and one that could not be kept up without great physical exertion and poorly executed work. The result is, therefore, that the current must be intermittently turned off and on, if scorching of thin goods is to be avoided.

Fig. 1.—Abesto Automatic Iron.

Fig. 2.—Phantom View Showing Internal Construction.

If the person engaged in the ironing is interrupted in her work, the probability of forgetting to turn off the current is great, and if that person is a servant of subnormal intelligence, like so many of that class, the likelihood of turning off the current during pauses in the work or when very thin materials are being smoothed is rather small. Consequently there arises the danger of not only scorching the goods, but even of setting the ironing board afire, which has happened in too many cases already. Of course, in the hands of a reasonably intelligent and careful person these dangers are small and the waste of electrical energy from keeping the current on continuously is also small. Nevertheless, there has arisen a demand for an automatic heat regulator that can keep the iron from getting excessively hot.

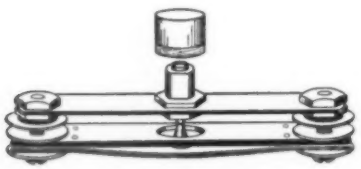


Fig. 3.—Thermostatic Cutout.

As the result of its extensive experience in manufacturing flatirons of all kinds, the Dover Manufacturing Company, of Canal Dover, Ohio, saw this need and set about to develop an electric iron with the automatic feature referred to. After prolonged experiments and repeated tests an iron of this kind has been placed on the market, which the manufacturers claim can be absolutely depended on to maintain its temperature at the point set when the simple directions for its use are followed.

A general perspective view of this iron is shown in Fig. 1. Fig. 2 is a phantom view to show the internal construction. The resistance element is imbedded in a very refractory insulating material. One of the terminal wires of the element connects directly to the binding screw to which one side of the cord circuit is connected; the other wire connects to the middle binding screw, and between the latter and the right-hand post (the other end of the cord circuit) are connected in parallel the thermostatic cutout and a condenser. A separate view of the

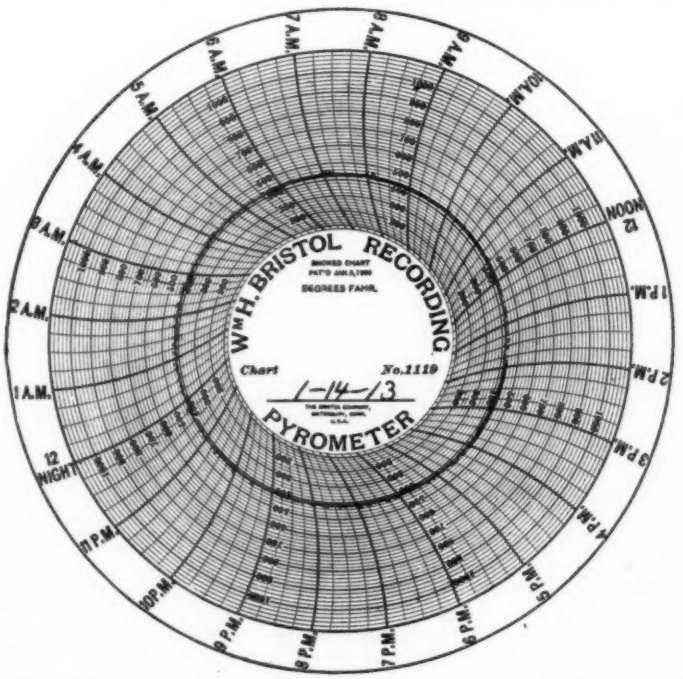


Fig. 4.—Pyrometer Record Showing Uniformity of Temperature Maintained.

thermostatic cutout is shown in Fig. 3.

It consists of a rigid steel bar to whose ends is firmly secured a bowed bar made of a special alloy with high coefficient of expansion. At its middle this bar carries a contact with platinum point. Above this is a relatively fixed but adjustable co-operating contact with platinum point. When the iron heats, the expansion bar bends more and more until at a definite temperature, depending on the adjustment, the contacts separate and the circuit is broken. Since the condenser is in parallel with this cutout, no troublesome arc is formed between the platinum points. As the iron cools a little the thermostatic bar bends back, bringing the contacts together again and restoring the heating circuit. The action of this bar is so sensitive and automatic that the device will maintain the temperature of the iron within five degrees of the temperature set. This is shown in the typical recording pyrometer chart reproduced in Fig. 4, the iron tested in this case being an Abesto automatic iron taken from regular stock.

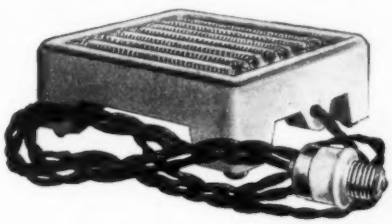
Fig. 5.—Stand for Converting Iron Into Stove.

In order to permit control of the temperature, an adjustable regulator is provided. This consists of an outside spring to which is fastened an insulated thumb screw. This engages an insulated cap which rests on the inside temperature spring that carries the upper contact point. By varying the tension on this spring it is possible to regulate the temperature of the iron at will between the limits of 200 and 600 degrees Fahrenheit, thus readily adapting the iron to the varying requirements of thin, medium and thick fabrics.

Among the advantages of the iron not yet referred to is economy of time in ironing, since the iron is always at the right temperature without removing the connecting plug or turning the current on and off; there is also considerable economy in the use of current because the iron is not allowed to become wastefully overheated. The iron is provided with a seven-foot cord, separable attachment plug and safety stand. There can also be supplied a special stand for holding the iron inverted so it may be utilized just as a disk stove (Fig. 5). This has an asbestos-lined cup fitting about the hood of the iron and thus confining its heat to the heating surface. By means of the automatic heat regulator the iron can be adjusted to keep utensils at a uniform temperature for slow simmering or boiling.

National Electric Toaster and Utility Stove.

A new combination electric toaster and general utility stove of low cost has been placed on the market by the National Electric Company, 149 West Michigan Street, Chicago. As shown in the accompanying illustration, it is of simple and graceful "arts and crafts" design. Its body is in one piece and made of a patented granite-like material with rich mahogany color; this material holds the heat exceptionally well and this, together with the arrangement of the heating coils giving direct heat, results in quick production of toast with the low energy consumption of but 400 watts. The toaster has nothing about it to tarnish and is very easily kept clean. It can be used similarly to a disk stove for general utility purposes, such as for warming dishes, boiling water, frying eggs, etc. Its neat finish and cheerful glow makes it an attractive dining-room table appliance.



National Toaster and Utility Stove.

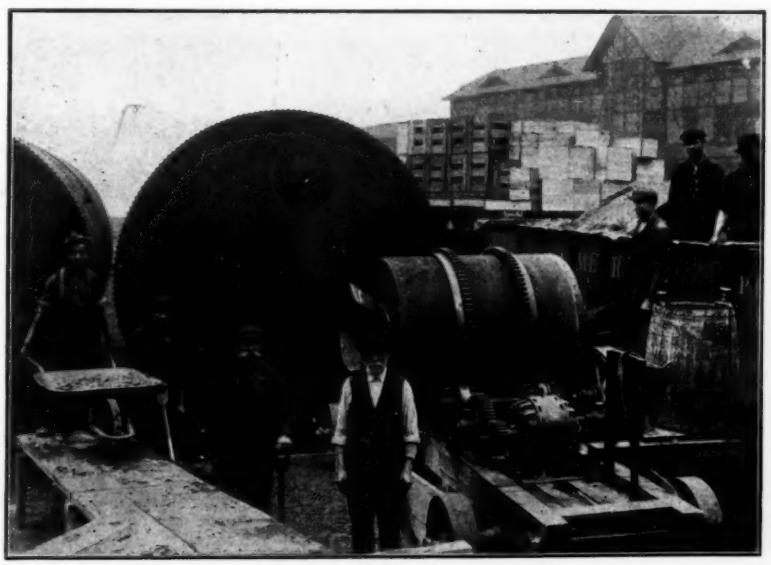
Motor-Driven Concrete Mixer.

Motor-driven concrete mixers are being used more and more extensively wherever electric current is available. The main reason for this growing popularity is that they are much more convenient to handle and are in general more economical than steam-driven mixers.

The illustration below shows how small the motor is in comparison with a corresponding engine and boiler. The weight is evidently greatly reduced, so that the outfit is more easily carried about and located wherever needed.

The elimination of the boiler also does away with fuel, water, ashes, smoke, sparks, and noisy exhaust. A licensed engineer is not required, and any intelligent workman can operate the motor and give it all the care it needs in ordinary service.

The motor is controlled by means of a knife switch. When at rest, it involves no expense, and it is always ready to start without waiting for steam. As a result, annoying delays are often avoided. The mixer shown in the illustration is driven by a Westinghouse induction motor.



Motor-Driven Concrete Mixer.

Magunna Tuning-Fork System for Wireless Work.

The Paris engineer, H. Magunna, has lately devised a system of wireless apparatus which is of interest on account of the new method employed for producing musical sparks by the use of continuous vibrations. It will be remembered that Mr. Magunna was engaged together with Professor Mercadier upon a multiplex telegraph method using sets of tuning forks to send waves of different pitch on the line, this having proved very successful. His recent idea in the way of wireless telegraphy also embodies the

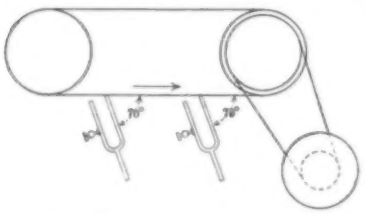


Fig. 1.—Tuning-Fork Arrangement.

use of a tuning-fork device in order to furnish proper low-voltage current for operating the primary of the induction coil for the wireless circuit.

Perfecting his previous tuning-fork apparatus, he now succeeds in making vibrators which convert direct current into vibratory current. The forks serve to break a direct current of 5 amperes and 220 volts so as to secure an oscillating current whose period is very constant. Using such current for wireless telegraphy apparatus he secures the well known advantage of the musical spark and at the same time has a less complicated outfit than usual so that it is well adapted for light and portable plants.

The principle which he uses is quite out of the ordinary, for instead of employing the usual electromagnetic method for setting up the vibration of the tuning fork, he first fixes the fork firmly in place, then disposes a small belt running between a pair of pulleys, so that the outer sharp angle of one of the prongs bears somewhat against the belt, and in this way the latter acts on the same principle of a violin bow in order to keep the fork in constant vibration. A small electric motor serves to drive the first pulley so as to maintain the belt in movement. In this way the usual electromagnet method for vibrating the fork is dispensed with, and all that is needed is an electric contact which the fork breaks regularly, using for this purpose a fixed contact screw working against one of the prongs in the customary way. In Mr. Magunna's wireless method, the tuning-fork break is connected in series with the transformer primary and telegraph key to the terminals of a small direct-current generator, using a condenser at the break to suppress the sparks. The frequency of the current thus obtained in the secondary of the transformer is equal to that of the fork and in consequence it is quite constant and does not depend on the speed of

Fig. 2.—Induction Coil, Motor and Fork.

the mechanical parts or motor. In practice he mounts two forks against the same belt, as shown in Fig. 1, one for 640 and the other for 760 double vibrations, standard pitch, and can use one or the other for the wireless transmission by throwing a two-way switch.

Boxing a Waverly Electric for Shipment to Japan.

Boxing a $3,500 electric automobile for shipment to a distant part of the world is an important piece of work, since electric automobiles are not primarily designed to be lifted by derrick and dropped roughly down the hatchway of an ocean-going ship.

Within a week two such shipments have been made from the Waverley Company's factory at Indianapolis, one going to Lima, Peru, via New York, to Colon, across the isthmus to Panama and then down the west coast of South America to Callao.

The second shipment was of a model 98 Silent Waverley Limousine-Five shipped via Chicago and Seattle in

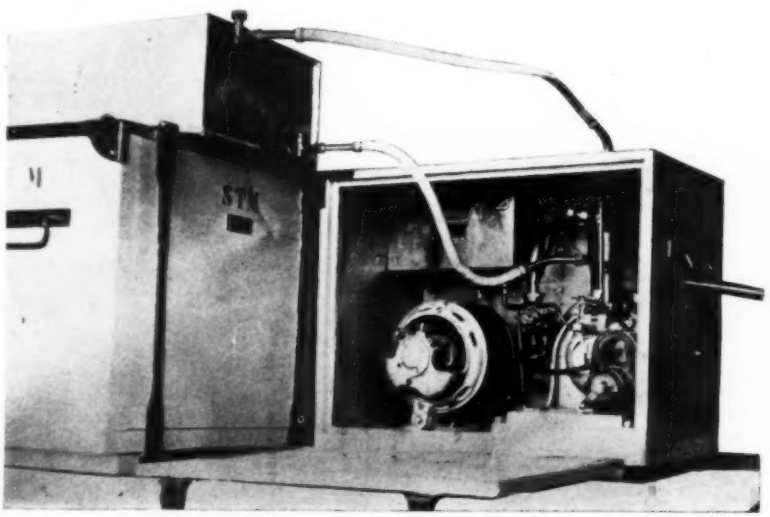


Fig. 3.—Gasoline-Engine-Driven Generator for Military Wireless Outfit.

Figs. 2 and 3 illustrate the several parts of the new portable military field station, and such parts are remarkably light, being also applicable to aeroplanes and airships, small boats and the like, and in some cases for cavalry pack use. The present army field posts are contained in four boxes, the first one holding the dynamo set and including a 1.25-horsepower gasoline engine for driving the dynamo by belt. The weight of this group is only 100 pounds. The dynamo furnishes 220-volts direct current which is then transformed to oscillating current in the tuning-fork device, the standard current in the vibrator being 5 amperes, corresponding to about 300 watts in the primary of the induction coil. Such wireless posts will work at a range of 50 miles in the daytime. Using a telephone receiver there is heard a musical note of quite constant pitch, and thus the sound is remarkably clear and is less interfered with than usual by outside disturbances.

care of the Japanese line at that port to Yokohama, Japan, for delivery to the purchaser at Tokio.

The wheels were removed and the axles rested in a heavy oak framework bolted to the outside box. The latter was built of matched pine with a lining of tar paper, firmly braced and all very substantially constructed. The batteries, which in this case were of Edison type, were packed in separate boxes.

Current Electrical News

LIGHTING AND POWER.

(Special Correspondence.)

KENMARE, N. D.—A white way will be installed here this month. C.

LAWLER, IA.—$6,000 will be expended for constructing an electric light plant. Address city clerk.

DULUTH, MINN.—Mayor Prince has recommended that the electric wires to be placed underground.

AYR, MONT.—A. J. Reid is preparing plans and will receive bids for the installation of a hydroelectric system.

RAVENNA, O.—The city council is planning to construct a municipal electric plant here. Address city clerk.

HOLSTEIN, IOWA.—The Holstein Service Company will install a new up-to-date electric light plant here. C.

MANITO, ILL.—The council plans to relocate the electric light plant and improve the lighting system. Address Mayor.

BENSON, N. C.—The council will recommend the establishment of an electric light plant here. Address Mayor.

INTERNATIONAL FALLS, MINN.—The Council will advertise for bids for the construction of a white way. C.

MAYVILLE, N. D.—Bids are advertised for automatic control and rewiring of the main building of the normal school. C.

NEWARK, N. Y.—The Municipal Board of this village is making plans for a system of street lighting. Address town clerk.

COLTON, CAL.—Plans are under way for the connection of the Crescent City electric line with the Southern Pacific road at Bloomington.

IRON MOUNTAIN, MICH.—The matter of improved lighting for several streets in the city is before the council. Address Mayor.

REDLANDS, CAL.—Work will soon be resumed upon the Baldwin power plant in Mill Creek Canyon, which was started last year.

HAMILTON, MO.—David Miller and H. L. Gilbert have purchased the local electric light plant. The new owners will improve and extend plant.

PORTLAND, ORE.—City Council contemplates installation of cluster lights in the Laurelhurst district. Address City Commissioner Daly for further information. O.

HENNESSEY, OKLA.—The Hennessey Oil and Gas Company has been incorporated with a capital stock of $30,000, by W. T. Parks, Charles Pepin and others.

ST. JOSEPH, MO.—The superintendent of the city lighting plant recommends the purchase of additional plant equipment. M. C. Hankes, superintendent.

CLEVELAND, O.—Bids will be received for electric light poles for the Municipal Electric Light department. Address W. J. Springborn, director of Public Service.

REED CITY, MICH.—A 30-year franchise has been granted to the Osceola Light & Power Company, at this place. Extensive improvements will be made to plant.

GREAT FALLS, MONT.—A lighting district has been formed to provide for the installation of additional lights on Second Avenue, South. Address City Clerk for information. O.

MANKATO, MINN.—The City council has voted to install a municipal lighting plant, and will at once secure competent engineers to prepare plans and specifications. C.

DETROIT, MICH.—Bids will be received until August 26, for a 5,000-kilowatt turboalternator, complete with surface condenser and condenser auxiliaries. Address city electrician.

SPOKANE, WASH.—Property owners along Trent and Main Avenues have petitioned the City Commission for the installation of a street lighting system on business streets between Lincoln and Division. O.

RUNGE, TEXAS.—The tax-payers of Runge will vote August 27 on the proposition of issuing $20,000 for the construction of an electric light and power plant and a municipal water works system. D.

HARRISBURG, PA.—The Laurel Electric Light and Power Company, of Red Lion, has been incorporated recently with a capitalized stock of $5,000, to operate in and around Red Lion, York, Pa.

HEPNER, ORE.—The Hepner Light & Water Company will rebuild its power plant which was recently destroyed by fire on a site obtained near the depot. M. Pruyn is general manager of the company. O.

ARLINGTON, KY.—The Arlington Lumber Company will install a small electric light plant for the service of its saw mill, and will also provide water service for the mill. A motor-driven pump may be needed. G.

SHOSHONE, IDA.—The substation of the Great Shoshone & Twin Falls Light & Power Company, was recently destroyed by fire. Officials of the concern at Twin Falls assert that the plant will be rebuilt at once. O.

WAKEFIELD, MASS.—This town, co-operating with the Bay State Street Railway Company, will place electric light wires and feed wires in underground conduits. The town has appropriated $2,000 toward the work.

JEFFERSONVILLE, IND.—This city is considering the installation of a "white way," and will take bids shortly on the installation and operation of a system consisting of 100 ornamental lighting standards surmounted with arc lamps. G.

DOLAND, S. D.—Local capital have organized a co-operative company, and will install and operate an electric light system here. Capital, $10,000. Officers: R. W. Labrie, president, F. J. Riley, secretary, F. S. Brown, treasurer. C.

SAN FRANCISCO, CAL.—The Pacific Light & Power Corporation has been granted permission to issue $2,500,000 of its capital stock, the proceeds to be used in development of its Big Creek power project in Fresno County.

CINCINNATI, OHIO.—Sargent & Lundy, of Chicago, are completing plans for the new power plant of the Columbia Gas & Electric Company, of Cincinnati, O. The building will be two or three stories high, and 220 by 270 feet in dimensions. The estimated cost is $500,000. G.

EATONVILLE, WASH.—Voters of this city recently voted in favor of constructing a municipal power plant to furnish light and power for Eatonville and the immediate vicinity. The proposed plant will be erected on Lynch Creek. For further information address City Clerk. O.

SEATTLE, WASH.—Frank Swank has asked for an extension of time on the franchise granted to him by the King county commissioners nearly five years ago for a power line connecting Seattle and Everett and serving the Laurelhurst and Yesler districts. The franchise expires in September.

WINLOCK, WASH.—The Veness Lumber Company here will build a 1,000-horsepower electric power plant near its mill, at once. A portion of the power derived, will be used in operating certain machinery in the mill, and the remainder will be sold to the Independent Electric Company. O.

LOS ANGELES, CAL.—The officials of this city are planning on between 12 and 18 miles of ornamental electric lighting for Los Angeles. It is claimed that the material and installation of this system will cost $2.25 and $2.50 per front foot. City Electrician Manahan is in charge of the work.

ALBANY, ORE.—A cluster lighting system has been adopted by the City Council here,—same to be placed from Calapooia Street down First to Lyons Street and out Lyons Street to the passenger station of the Southern Pacific Railway Company, also on Second Street from Washington to Lyon and on other streets. O.

BAKER, ORE.—Plans and specifications for the proposed municipal lighting plant were recently placed in the hands of the City Commissioners for their inspection,—if same are approved, work on the construction of the power and lighting plant will be

ordered shortly. For further information, address City Clerk here. O.

SAULT STE. MARIE, MICH.—The Michigan Northern Power Company, has been incorporated for the purpose of maintaining water courses for accumulating, selling, furnishing and supplying electric current for power purposes. Capital stock, $3,000,000. E. J. H. Wright, Oak Park, Ill., A. F. Bordwel, Downers Grove, Ill., incorporators.

VANCOUVER, B. C.—Members of the Rate Payers Association of this city have started a campaign for the establishment of a municipal electric light and power plant. The Kerrisdale Rate Payers Association have asked that the neighboring municipalities be included in the scheme, so that they may be able to derive benefits from the proposed improvement. O.

LOS ANGELES, CAL.—The officials of this city are establishing an underground conduit system here, the work being done in connection with the distribution system of light and power to be generated by the aqueduct power project. In this work $12,000 has already been expended and a like amount will be used in furthering this work in the near future. T.

FORT MADISON, IA.—By a vote of 1,071 to 369 the right to sell and distribute electric power and light in Fort Madison, was granted to Stone and Webster, distributers for the Keokuk dam, at a special election. Not only does this allow the company to sell power and light in this city, but means that power lines to the north and west will run through the town.

LOUISVILLE, KY.—Encircling the city and feeding mains at points on the east, south and west sides a gigantic belt line for natural gas costing hundreds of thousands of dollars will be built by the Louisville Gas and Electric Co., before the natural gas pipe line from the West Virginia border is completed. All engineering plans have been completed.

CINCINNATI, O.—The Park Commission will receive bids August 15 at 2005 Gilbert Avenue for the installation of 15 series incandescent electric lamps with underground connections thereto, complete in every detail. Lamp posts will be of cast iron and of a design on file at the above offices. Globes will be 16 inches diameter of a grade of glass known as "Alba." Lamps will be 4 ampere series Mazdas. Conduits are to be laid in the space between curb and sidewalk.

CHICKASHA, OKLA.—The Chickasha Gas & Electric Company has announced that it will immediately spend $50,000 in improving the plant of the Chickasha, Light, Heat & Power Company. The gas company was given permission by legislative act last winter to purchase the plant of the light, heat and power company and is now ready for the actual consolidation. New engines, boiler and other machinery, increasing the capacity of the plant more than 1,000 horsepower, will be added.

SAN FRANCISCO, CAL.—The board of directors of the Pacific Gas & Electric Company has called a special meeting of the stockholders of the company to be held on September 10, for the purpose of authorizing an issue of 6-per-cent gold notes of a maximum value of $7,000,000. The proceeds are to be used as follows: To take up demand notes for advances already made by the bankers and yet to be made pending authorization of the gold notes by the stockholders; to pay other current indebtedness of the company for the construction work and the extension of the company's business.

PORTLAND, ORE.—Commissioner Daly, of the Public Utilities Department, is formulating a plan for the construction of a municipal lighting system to light the city of Portland. The first step in this direction was taken recently, when valuable power rights on the Zigzag, a turbulent stream in the Mt. Hood district, about 40 miles from Portland, were transferred to the city. It is estimated that with practically little development work, over 7,000 horsepower can be obtained on this stream, and by building reservoirs, a much larger amount of power may be generated. Commissioner Daly will appoint an engineer, to investigate the feasibility of the project, also to assist him in formulating a plan for developing the power and transmitting same. At the present time, the city is paying $185,000 per year for lighting the municipal buildings and streets. O.

TELEPHONE AND TELEGRAPH.

(Special Correspondence.)

ALTURAS, CAL.—The C. W. Dent Company has been granted a telephone franchise in this city.

FARGO, N. D.—The North American Telegraph Company has been granted the right to operate in the city of Fargo.

TYLER, TEX.—The Southwestern Telegraph and Telephone Company will erect an office and exchange building, to be three stories high.

TOMBSTONE, ARIZ.—The Navajo-Apache Telephone Company is preparing to open exchange offices at Conche and Springville.

FALLON, NEV.—The Utah, Nevada & Idaho Telephone Company is extending its lines to connect this city with points in Mason valley.

BRENHAM, TEXAS.—The Washington County rural telephone lines are to be extended. Address secretary of the Board of Local Improvements.

SUMMERLAND, B. C.—Work has been ordered to begin at once on the erection of a telephone line to run between West Summerland and Summerland. C.

ABERDEEN, S. D.—The Groton-Ferney Mutual Telephone Company, has petitioned the City Commission for permission to enter Aberdeen with its line. C.

SAN DIEGO, CAL.—Six new trunk lines to Ocean Beach will be strung by the Pacific Telegraph & Telephone Company before September 15. Address Manager W. E. Franklin.

WESTCHESTER, PA.—The Borough Council of this city has passed an ordinance permitting the Bell Telephone Company to construct conduits on certain streets and to put its wires underground.

OSHKOSH, WIS.—An appropriation has been made for improvement of the Wisconsin Telephone Company, to the amount of $55,000, $6,000 to be used for repairs and additions to the local exchange. C.

VANCOUVER, B. C.—The Dominion Government will shortly begin construction of a telephone line from Lytton to Lillooet. S. A. McFarland, Lillooet, will have charge of work. Proposed line will be 47 miles long. O.

RAY, ILL.—The Flatwoods and Ray Telephone Company has been incorporated with capital stock of $450 to operate a farmers' mutual telephone company. The incorporators are W. F. Aten, George E. Cook and Adam P. Seasley of Ray. Z.

SAN FRANCISCO, CAL.—The Marconi Wireless Telegraph Company announces that it will soon erect a 25-kilowatt station at Ketchikan and a 10-kilowatt station at Juneau, Alaska, the two plants to cost approximately $60,000.

PALOUSE, WASH.—The city council recently granted a franchise to the Inland Telephone Company to construct, operate and maintain a long distance telephone service in this city. George R. Boomer, Spokane, is president of the company. O.

SPOKANE, WASH.—The Davenport Independent Telephone Company here, recently filed articles of incorporation with the Secretary of State, Olympia, Wash. The company is capitalized at $35,000. A. T. West, C. N. Thomas and W. H. Armin, all of Spokane, are the incorporators. O.

EL PASO, TEXAS.—It is announced that the Mountain States Telephone and Telegraph Company will build a second long distance line between El Paso and Bisbee, Ariz. The company is extending its long distance systems in the Yuma and Phoenix districts and is also making improvements to its line between Globe and Clifton, Ariz. D.

MALDEN, WASH.—The Malden Telephone Company, recently purchased by E. E. Seigel has been taken over by the Rosalia Telephone Company and will be operated as a branch of that company. The council will grant a new franchise to the purchasers and in return Malden will have connections with Rosalia and other nearby towns as well as a 24-hour service. O.

SEATTLE, WASH.—The Northern Wireless Telegraph Company was recently organized in this city for the purpose of establishing direct telegraphic communication between Seattle and the Shushanna, Alaska, gold fields. The company will incorporate for $60,000 at Carson City, Nevada. The incorporators are prominent business men of Seattle, prominently identified with the Chamber of Commerce. G. L. Milligan, of Seattle, will superintend the construction of the station and will manage the affairs of the new concern. O.

ELECTRIC RAILWAYS.

(Special Correspondence.)

PITTSBURG, CAL.—The Oakland, Antioch & Eastern Railroad has been granted a franchise in this city.

SAN DIEGO, CAL.—The Los Angeles and San Diego Railway plans extensions to La Jolla. Address E. S. Babcock, president.

LOS ANGELES, CAL.—The Los Angeles Railway Company has plans under way for the extension of its Main-street line to Alhambra.

SAN DIEGO, CAL.—The San Diego Electric Railway Company has applied for a franchise for a double track trol-

ley line from F and Twelfth Streets to El Cajon Avenue.

SAN DIEGO, CAL.—The Los Angeles & San Diego Beach Railway, known as the La Jolla line, is soon to be transformed into an electric line.

BALDWIN, WIS.—The work of building the new electrical line from Burkhardt to Baldwin to furnish the electric service here will soon commence. C.

NASHVILLE, TENN.—The Nashville Traction Company has given bond of $200,000 for the construction and operation of an electric railway system in that city in four years. G.

EVANSTON, ILL.—A proposition to build a street-car line to connect Evanston with Chicago was perfected to members of the Evanston Council at a special meeting by L. E. Myers, a street railway builder.

BOWLING GREEN, KY.—W. H. Brashear is planning the construction of an electric railway from this city to Beech Bend Park, a distance of three miles. The trackage will cost $15,000. A power plant may also have to be built. G.

SMITHLAND, KY.—J. B. Trail and J. E. Massey are planning the construction of an electric railway from Smithland through Livingston county and beyond. Financial arrangements for the construction of the line have been completed, it is said. G.

PORTLAND, ORE.—The United Electric Railway Company has filed an application with the City Commissioners for a franchise to construct a freight track along Macadam Street. If same is granted, work will be ordered immediately. O.

MADISONVILLE, KY.—The Commercial Club has taken up work for the construction of an interurban traction line from Madisonville to Dawson Springs by way of Nortonville, and its railroad committee is now securing rights of way and subscriptions. G.

OKLAHOMA CITY, OKLA.—The Oklahoma Railway Company, which has contracted for an extension of its line from Moore to Norman, Okla., will also build 30-mile lines running from Oklahoma City to Shawnee and Oklahoma City to Guthrie. John W. Shartel is vice-president and general manager. G.

RIVIERA, TEXAS.—The Riviera Beach & Western Railroad is having a survey made for a proposed extension of its lines from Riviera to Hebbronville, about 60 miles. The route is via Falfurrias and through a region that formerly was devoted exclusively to ranching, but which is now being rapidly converted into farms. D.

HAMILTON, ONT.—The Canadian Pacific Railway Company will build an electric railway to connect Hamilton and Buffalo with the idea of operating its own freight lines now being used. The new line will be built from Hamilton to Niagara Falls and from there to Buffalo, a cross over to be made somewhere in this vicinity. Address M. R. Fairburn, chief engineer, Montreal, Que.

EAST ST. LOUIS, ILL.—The Alton & Southern Railroad has been incorporated with capital stock of $10,000 to build a line beginning at a point opposite the city of St. Louis through East St. Louis to a point at or near the easterly banks of the Mississippi River in Madison County, Illinois. The incorporators are C. B. Fox, Gilbert McCullough, C. E. Rodgson, C. W. Souder, R. S Sherwin, Ford W. Abt and William H. Hebenstreit. Z.

SAN RAFAEL, CAL.—C. J. Norton appeared before the Railroad Commission with a petition for the incorporation of the San Rafael & San Anselmo Valley Railroad Company, which proposes to build a line from Puerto Suello on Petaluma Avenue in San Rafael, to a point about half a mile westerly to Fairfax. The necessary franchises through San Rafael, San Anselmo and the county of Marin have already been secured. The company will be capitalized at $100,000.

TAMPICO, MEXICO.—The Tampico Light & Power Company, which is composed of British capitalists, headed by Lord Cowdray of the firm of S. Pearson & Sons, Ltd., has begun the construction of an extensive system of electric street railways here. It will also build an interurban electric line from Tampico to the suburban resort of La Barra, six miles. The same interests own the electric street railway system in Vera Cruz and are operating the National Tehauntepec Railroad under a 51-year lease. D.

SEATTLE, WASH.—The Finance and Utilities committees of the city council has recommended to the city council that the city take over the line of the Seattle, Renton & Southern Railway Company, providing the offer of $1,200,000 be accepted by Scott Calhoun and Joseph Parkin, Receivers of the line. In all probabilities the offer of the city will be accepted and if such is the case extensions and improvements will be made at once. A. L. Valentine, superintendent of Public Utilities. Howard Joslyn, city electrician. O.

SEATTLE, WASH.—David Swank, represented by Tucker & Hyland, attorneys of this city, will build a second interurban street-car line connecting Seattle with Everett, and serving the Laurelhurst and Yesler districts, the last to be annexed to the city, and touching Bothell and Snohomish, providing the City Council grants an extension of time on the franchise granted to Mr. Swank by the King County Commissioners nearly five years ago. The line as proposed will make a connection with the terminus of the Ravenna Park line of the Puget Sound Traction Light & Power Company, entering the city by way of the Erickson Road. The matter will come up for definite settlement shortly. O.

NEW PUBLICATIONS.

ELECTROLYTIC METHOD OF PREVENTING CORROSION OF IRON AND STEEL.—The United States Bureau of Mines, Washington, D. C. has issued technical paper No 15 with the foregoing title. It is a preliminary report by J. K. Clement and L. V. Walker of experiments made under the direction of the Bureau to develop an electrolytic method for preventing corrosion. The results appear to justify the hope that the method may be applied successfully in mines for protecting iron and steel against the corrosive action of acid underground waters, as well as for protecting structures and machinery that are exposed to the acid waters of streams.

HANDBOOK FOR WIRELESS TELEGRAPH OPERATORS.—The Handbook for Wireless Telegraph Operators of working installations licensed by his Majesty's Postmaster-General, revised in accordance with the Radio-Telegraph Convention in London, 1912, has been published by Eyre & Spottiswoode, Limited, London. This handbook gives complete instructions for the guidance of wireless telegraph operators on board ship and at coast stations with regard to the acceptance and treatment of telegrams, the transmission and receipt of signals, and other details of actual working. It does not in any way deal with the scientific principles of wireless telegraphy, the details of apparatus or the details of the various systems. For the most part the instructions apply primarily to operators on board ship, but for the sake of completeness certain instructions have been added which apply only to operators at coast stations.

PROPOSALS.

ELECTRIC LIGHT PLANT, ETC.—Sealed proposals will be received by E. M. Markham, mayor, Memphis, Tenn., until August 21 for furnishing turbines, pump set, feed water heater and electric light plant for Hydraulic Grader No. 1,401.

LIGTING FIXTURES.—Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until 3 p. m., August 28, for furnishing and installing lighting fixtures in the new building for the Bureau of Engraving and Printing, Washington, D. C., in accordance with drawings and specifications, copies of which may be had from the Supervising Architect.

INSTALLATION OF ORNAMENTAL STREET LIGHTING.— The Baraboo Commercial Association requests bids on the furnishing of the installation of an ornamental system of street lighting, exclusive of the material, in the city of Baraboo, Wis. The following are the quantities to be installed: 8,000 lineal feet of steel-armored, three-wire, No. 6 conductor, 1,500 feet of which to be placed in macadam and balance under brick pavement with macadam base. The ornamental posts will consist of 98 Cutter single-light poles installed on concrete sidewalk. Bids are to be filed with T. E. Mead, secretary, Baraboo, Wis., not later than August 20, 1913.

FOREIGN TRADE OPPORTUNITIES.

(Parties interested in the following items should address the Bureau of Foreign and Domestic Commerce, Washington, D. C., and refer to the file number noted.)

NO. 11,372. REFRIGERATION PLANTS FOR HOUSES.—A report from an American consular officer in Canada states that an electric railway company, which also deals in electrical appliances, desires to communicate with manufacturers of individual refrigeration plants operated by electricity for use in private houses, the current to be supplied from the regular lighting circuit. The company thinks there is an exceptionally good market for this article if not too expensive.

NO. 11,428.—TELEPHONE APPARATUS.—A foreign business man informs an American consular officer that he has obtained two telephone

concessions, and he is very anxious to secure information regarding the most modern systems of telephone apparatus, especially automatic apparatus.

NO. 11,368. ELECTRIC BED LIFTS.—Tenders will be received by the Chairman of the Tender Board, Provisional Auditor's Office, Cape Town, South Africa, until September 10, for the supply and delivery of electric bed lifts for the new hospital at Port Elizabeth. Specifications and other information may be obtained from the Secretary, Public Works Department, Pretoria, or the District Engineer, Public Works Department, Cape Town.

NO. 11,381. ELECTRICAL APPARATUS.—An American consul in Australia reports that an importer in his district desires catalogues and price lists from manufacturers in the United States of the following articles to be used with electric attachments: Heating pad for chest and bed, curling irons and foot warmers, shaving-water heaters, baby milk warmers, reading lamps, hair dryers, luminous fountains, washing machine, cutlery polisher, motor and dish washer, potato and apple peelers, waffle irons, toasters, teakettles, frying pans, mica sheets, and novelties.

FINANCIAL NOTES.

Stockholders of the Michigan State Telephone Company have been offered the right to subscribe at par to new stock on or before August 20, which will bring the capitalization of the company up to the authorized amount of $10,000,000,—$6,000,000 common and $4,000,000 preferred.

Cumberland County Power & Light Company has acquired control of the York Light & Heat Company and the York Power Company, which means a further rounding out of the Cumberland County system and important additions to the activities of the company in the public utilities field.

Papers have been filed announcing the consolidation into the United Power & Light Company of this city of twenty-one electric companies incorporated for districts in Allegheny, Beaver and adjoining counties, Pennsylvania. The capital of the combination is $110,000, the officers being George R. Barnett, Harrisburg, president, and E. E. Barnitz and John H. Alricks, Harrisburg, and George Heard, Pittsburg, directors, the latter being treasurer.

Pacific Gas and Electric Company has called a special meeting of stockholders for September 10 to authorize an issue of 6-per-cent notes of a maximum amount of $7,000,000 to mature June 26, 1914, and to be secured by collateral of $5,000,000 par value, general lien bonds. Proceeds of the notes will be used to take up demand notes for advances made by the bankers pending authorization of this issue and to pay other current indebtedness of the company. The remaining $2,500,000 of these notes will be reserved for future needs of the company.

In connection with the increase in the capital of the Montreal Light, Heat & Power Company to $22,000,000, from $17,000,000, directors have notified shareholders that they will offer $1,700,000 at par, on the basis of one new for each ten old shares on the books on September 15. Warrants will be issued to shareholders, stating the number of shares they are entitled to, on or before October 1. New shares are payable, $25 for each share, on November 17, 1913, and February 16, May 15, and August 17, 1914. Failure to pay any installment renders previous payments liable to forfeiture. The right to subscribe will expire November 17. New stock will rank with existing stock for dividends for the quarter ending October 31, 1914.

Dividends.

American Power & Light Company; regular quarterly dividend of 1 per cent on common, payable September 1.

Central Arkansas Railway & Light Corporation; a quarterly preferred dividend of 1.75 per cent payable September 2 to stock of record August 15.

Federal Utilities; regular quarterly dividend of 1.5 per cent on the preferred, payable August 30 to stock of record August 15.

Illinois Traction System; a quarterly dividend of 0.75 per cent, payable August 15 to stock of record July 26.

Harwood Electric Company; the regular semi-annual dividend of 3 per cent on the preferred stock payable September 2 to stockholders of record August 20.

Middle West Utilities Company; regular quarterly of $1.50 on the preferred stock, payable September 2 to stock of record August 15.

Mobile Electric Company; regular quarterly of 1.75 per cent on the preferred stock, payable August 15 to stock of record July 30.

Rochester Railway & Light Company; a quarterly preferred dividend of 1.25 per cent, payable September 2 to stock of record August 25.

Report of Earnings.

COMMONWEALTH RAILWAY COMPANY.

The report of the Commonwealth Power, Railway & Light Company for the year ended June 30, 1913, shows net earnings of $1,436,234, against $1,102,105 in 1912. The condensed income account compares as follows:

	1913.	1912.
Earnings on stock owned in subsidiary companys	$1,499,958	$1,098,930
Miscellaneous earnings.	155,556	82,238
Gross earnings	$1,655,514	$1,181,168
Expenses and taxes	90,186	64,864
Interest	129,093	14,198
Total deductions	$219,280	$79,063
Net income	1,436,234	1,102,105
Dividend on preferred stock	*460,000	360,191
Surplus	$976,234	$741,914

*Includes $100,000 to cover dividend requirement for the months of May and June, 1913, on the $10,000,000 of additional preferred stock issued as of May 1, 1913.

MOBILE ELECTRIC.

Mobile Electric Company, for twelve months ended June 30, 1913, reports earnings as follows:

	1913	1912
Gross earnings	$378,628	$367,665
Net after taxes	179,181	174,578
Surplus after charges	94,381	85,894
Balance after preferred dividends	34,706	26,219

MONTREAL TRAMWAYS COMPANY.

Earnings of the Montreal Tramways Company for year ending June 30, 1913, follow:

Gross earnings	$6,754,227
Operating expenses	4,032,663
Net earnings	2,721,563
From which deduct:	
City's per cent on earnings	489,080
Interest and taxes	1,594,152
Net income	638,331
Dividends	156,382
Surplus	481,949
Discount on bonds transferred to contingent fund reserve accounts	287,384
Surplus	194,565

Exclusive franchises have been granted in Parish of St. Laurent and town of Mount Royal for 25 years and Pointe Aux Trembles and Montreal East for 40 years.

AMERICAN PUBLIC UTILITIES.

American Public Utilities Company, for June, 1913, and the nine months ended June 30, 1913, reports consolidated earnings of subsidiary properties as follows:

	1913.	1912.
June gross	$ 151,364	$ 138,803
Net after taxes	63,091	50,858
Miscellaneous income	10,387	.....
Net income after expenses	68,244	.....
Surplus after charges	20,373	.....
Balance after preferred dividends	803	.....
Nine months gross	1,720,850	1,510,661
Net after taxes	783,227	666,625
Miscellaneous income	58,419	.....
Net income less expenses	811,663	.....
Surplus after charges	382,502	.....
Balance after preferred dividends	206,372	.....

PACIFIC LIGHT & POWER CORPORATION.

Pacific Light & Power Corporation reports earnings for June, 1913, and the six months ended July 30, 1913, as follows:

	1913	1912
June gross	$ 277,657	$ 209,215
Net after taxes	104,483	106,374
Surplus after charges	66,017	64,925
Six months gross	1,362,907	1,207,413
Net after taxes	627,656	523,818
Surplus after charges	392,118	275,578

MUSKOGEE GAS & ELECTRIC.

Muskogee Gas & Electric Company reports for the twelve months ended June 30, 1913, as follows:

	1913	1912
Gross earnings	$521,206	$529,978
Net after taxes	219,891	211,062
Surplus after charges	148,168	139,870
Balance after preferred dividends	47,837	40,575

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Aug.11.	Aug. 4.
American Tel. & Tel. (New York)	129	128¼
Commonwealth Edison (Chicago)	141	144
Edison Electric Illuminating (Boston)	270	*270
Electric Storage Battery common (Philadelphia)	47	46¾
Electric Storage Battery preferred (Philadelphia)	47	46¾
General Electric (New York)	140⅝	139
Kings County Electric (New York)	129	129
Manhattan Transit (New York)	1½	1⅝
Massachusetts Electric common (Boston)	14	14
Massachusetts Electric preferred (Boston)	73	73
National Carbon common (Chicago)	114	116
National Carbon preferred (Chicago)	113	113
New England Telephone (Boston)	145	*140½
Philadelphia Electric (Philadelphia)	21⅞	21⅝
Postal Telegraph and Cables common (New York)	80	77
Postal Telegraph and Cables preferred (New York)	64	66
Western Union (New York)	67	64
Westinghouse common (New York)	63½	62¼
Westinghouse preferred (New York)	111	110

*Last price quoted.

PERSONAL MENTION.

MR. CARLETON TAYLOR, an electrical engineer of Los Angeles, and Miss Edna Mellus of the same city, were married recently in Los Angeles. After a trip of several weeks, Mr. and Mrs. Taylor will live in Los Angeles.

MR. CHARLES F. POTTER, general counsel for the Southern Sierras Power company, will hereafter have his headquarters in Los Angeles, and will act in the capacity of special counsel. JUDGE JOHN B. DIXON of Los Angeles, will succeed Mr. Potter as general counsel.

MR. GUY E. TRIPP, chairman of the board of directors of the Westinghouse Electric & Manufacturing Company, sailed on August 9 on the *Imperator* for a five weeks' trip through Europe. While abroad Mr. Tripp will visit the foreign subsidiaries of the Westinghouse Company.

MR. C. A. WILLIAMS, field agent of the United States Census Bureau, is in charge of an electrical census of 45 counties in Indiana, in which Indianapolis, Evansville, Richmond and New Albany are located. The census covers street railways electric light systems and telephone plants.

MR. LEON W. McLELLAN has been appointed manager of the new business department for southern Indiana for the Middle West Utilities Company, making his headquarters at New Albany, Ind. He will be concerned chiefly with the properties at New Albany and Jeffersonville, operated by the United Gas & Electric Company.

MR. HENRY J. KAUFMAN announces that he has established headquarters at 122 South Michigan Boulevard, Chicago, for the handling of the electric controlling devices for alternating and direct currents manufactured by the Sundh Electric Company, New York city. The necessary repair parts will be carried in stock and a competent man kept to make repairs that may become necessary.

MR. FRANK H. EVANS has been appointed commercial agent of the La Crosse Gas & Electric Company, La Crosse, Wis. Mr. Evans has been connected with the Public Service Gas & Electric Company of Plainfield, N. J., in various capacities for the past six years, being the new-business manager at the time of his resignation. The Gas & Electric Company of La Crosse has only handled gas appliances until recently, and intends to put in fully equipped display rooms, etc.

MR. S. W. CHENEY has been appointed assistant engineer of Kelsey Brewer & Company, with headquarters at Grand Rapids, Mich. Mr. Cheney leaves the position of engineer and general superintendent of the La Crosse Gas & Electric Co., La Crosse, Wis., which he has filled for the past four months. He had been identified with public utility industries since his graduation from the University of Wisconsin, in 1904, since that time having filled responsible positions at Denver, Colorado, Lincoln, Nebraska, Montgomery, Alabama, and with the Railroad Commission of Wisconsin.

MR. A. W. HIGGINS has been appointed engineer and general superintendent of the La Crosse Gas & Electric Co., of La Crosse, Wis. Mr. Higgins has been doing engineering work since graduating from the Massachusetts Institute of Technology in 1901, in various capacities. He has been associated with the E. H. Abadie Company, St. Louis, Mo., engineers and contractors, and more recently was in charge of the installation of the power plant for the Big Muddy Coal & Iron Company, of Herrin, Ill. Mr. Higgins succeeds S. W. Cheney, who goes to the home office of Kelsey Brewer & Company, at Grand Rapids, Mich., which operates the La Crosse company.

MR. JAMES G. POMEROY, who resigned some time ago as general sales manager of the Adams-Bagnall Electric Company, Cleveland, and moved to Los Angeles, has gone into business there as a manufacturers' agent. Mr. Pomeroy, before going to Cleveland, was for 18 years the western manager of the Adams-Bagnall Company, and is one of the best known men in the electrical industry. He enjoys a splendid reputation for business sagacity and integrity, and with his wide acquaintance throughout the industry should be very successful in his new enterprise. Mr. Pomeroy is desirous of getting in touch with manufacturers of standard electrical material in order to complete his representations at the earliest possible moment.

"JACK" IRWIN, veteran of the Boer war and Zulu rebellion, first aerial operator of an airship, one of the principals in Wellman's daring attempt to cross the Atlantic in the dirigible balloon "America," has just assumed the duties of superintendent of the northern division of the Marconi Wireless Telegraph Company with headquarters at Seattle, Wash. For some time past Mr. Irwin was commercial superintendent of the Pacific Coast division of the company at San Francisco. He is succeeding Mr. R. H. Sawler. Mr. Irwin is the operator, who, while operator of the American line out of New York, received the "C. Q. D." call from the steamship "*Republic*" which was wrecked on the Atlantic in 1908 and sent assistance to her.

DR. VLADIMIR KARAPETOFF, professor of electrical engineering at Cornell University started on August 6, on an extended trip West, for the purpose of visiting the principal hydro-electric developments and high-tension power transmission plants. He expects to visit the recent development on the Mississippi River at Keokuk, Iowa, and then go to Denver, Salt Lake City, Los Angeles, San Francisco, Portland, and Seattle. It is his intention to attend the Pacific Coast convention of the American Institute of Electrical Engineers in Vancouver, B. C., September 9 to 13 and to return East by the way of Canadian Pacific Railroad. He will be back at Ithaca about September 20 in time for the beginning of the school term. Mrs. Karapetoff will accompany her husband.

MR. STEPHEN L. COLES has been appointed acting secretary-treasurer of The Society for Electrical Development, Incorporated, vice Philip S. Dodd, resigned. As announced in these columns several months ago, Mr. Coles' services were retained by the Society as director of publicity. For the past four months the Society has loaned Mr. Coles to the Toronto Electric Light Company, Limited, of Toronto, Ontario, where he has been engaged with constructive service and advertising problems. Mr. Coles has had 25 years' experience in daily newspaper, magazine, weekly and advertising agency work, and was for several years managing editor of the ELECTRICAL REVIEW. His electrical education was obtained at the Massachusetts Institute of Technology and in the field during the formative period of the electrical industry.

MR. FRANK N. BOYER has been appointed district manager in St. Louis for the General Electric Company, succeeding the late Mr. George D. Rosenthal. Mr. Boyer has been assistant district manager of the Chicago office of the General Electric Company for several years, and has been active in the electrical industry in the Middle West for a long time. In the early eighties he was superintendent of the Edison Light & Power Company, of Reading, Pa., and in 1889, became connected with the Chicago office of the Edison General Electric Company. With the consolidation of the Edison and Thomson-Houston Companies into the General Electric Company in 1892, Mr. Boyer was made assistant manager of the supply department of the Chicago office. Three years later he became manager of this department, which position he held for more than 13 years. When the late Mr. James W. Johnson was made manager of the Chicago office, Mr. Boyer was promoted to the position of assistant manager. "Pop" Boyer, as he is familiarly known, is one of the best known men in the electrical industry, and is held in high esteem and affection by a host of friends and acquaintances.

MR. PHILIP S. DODD resigned from his position as secretary-treasurer of The Society for Electrical Development, Incorporated, on August 1, in accordance with an understanding made at the time he took the office. No announcement of Mr. Dodd's future is made at this time, although it is understood that he will leave the electrical industry. "Phil" Dodd is among the best known men in the electrical field. He first attracted attention through his work on the ELECTRICAL REVIEW, of which journal he subsequently became business manager. From the publishing business he went to the National Electric Lamp Association as director of its department of publicity. Here his work in furthering the co-operative ideas of Mr. J. Robert Crouse proved so successful that he was unanimously selected as the junior executive officer of The Society for Electrical Development. The electrical industry loses a good man with his retirement. Mr. Dodd's enthusiasm and stick-to-itiveness won him a prominent place and his abilities in advertising and in organization work are recognized as exceptional. A host of personal friends in the industry and hundreds to whom he was known only by reputation or correspondence will regret his leaving and wish him every success in his new work.

OBITUARY.

ALBERT E. HEWITT, superintendent of the street car lines of the Rutland Railway, Light & Power Company, of Rutland, Vt., died August 6, of heart disease, at the age of 29 years.

NEW INCORPORATIONS.

HARBOR BEACH, MICH.—Harbor Electric Company has been incorporated with a capital stock of $10,000 to operate an electric lighting plant.

MADISONVILLE, TEX.—Madisonville Light & Power Company has been incorporated with a capital stock of $6,500 by A. A. Allen, A. E. Page and F. E. White.

SEATTLE, WASH.—Electric Traffic Signal Company has been incorporated with a capital stock of $35,000 by B. A. Hendricks, F. E. Parker and others, of Seattle.

BUFFALO, N. Y.—The Neubeck Electro-Plating Company has filed articles of incorporation with a capitalization of $10,000. The directors are James Franklin, George S. Shea and Percy S. Landsdowne, all of this city.

OLYMPIA, WASH. — Washington Public Service Company has been incorporated with a capital stock of $1,500,000 to operate electric railways, etc. The incorporators are Millard Lemon, W. B. Foshay and others.

DOVER, DEL.—The Trinity Electrophone Company, of Philadelphia, has been granted articles of incorporation with a capitalization of $100,000. Alva D. Jones, of Philadelphia, is named as the principal incorporator. N.

LOS ANGELES, CAL.—The Pacific Storage Battery Company has been incorporated in this city with a capital stock of $10,000. The incorporators are J. B. Chase, W. B. Chase, R. P. Morgan, J. E. Morgan and M. C. Levy. T.

CHICAGO, ILL. — Merrill Electric Manufacturing Company has been incorporated with a capital stock of $2,500 to deal in electric machinery and appliances. The incorporators are F. W. Merrill, J. L. Arthur and L. A. Nelson.

NEW YORK, N. Y.—The Philadelphia Gas & Electric Fixture Company of Manhattan, has filed articles of incorporation with a capitalization of $10,000. The incorporators are Max Unger, who is president, and Rosebell Unger, who is secretary.

MERIDEN, CONN.—The H. E. Rainaud Company, manufacturer of gas and electric lamps, has filed articles of incorporation with a capitalization of $50,000. The incorporators are Henry E. Rainaud, William Rainaud and Rosalie Rainaud.

NEW YORK, N. Y.—The Bryant Electric Company, Incorporated, has been granted articles of incorporation with a capital stock of $1,000 to engage in the electrical contracting business. The incorporators are Karl F. Abele and Annie B. Abele, and Walter Fuerst, all of New York City.

NEW YORK, N. Y.—Electrical Supervision Company, Incorporated, has been granted articles of incorporation with a capitalization of $1,500 for the purpose of installing electric meters. The incorporators are Isadore Kashare and George W. Goddard, of New York City, and Clarence E. LeDoux, of Brooklyn, N. Y.

DATES AHEAD.

Michigan Section, National Electric Light Association. Annual convention, Ottawa Beach, Mich., August 19-21.

International Association of Municipal Electricians. Annual meeting, Watertown, N. Y., August 19-22.

Old-Time Telegraphers and Historical Association and Society of the United States Military Telegraph Corps. Annual reunion, Detroit, Mich., August 26-28.

American Electrotherapeutic Association. Annual meeting, New York, N. Y., September 2-4.

National Electrical Supply Jobbers' Association. Fall meeting, Clifton Hotel, Niagara Falls, Canada, September 8-10.

Association of Edison Illuminating Companies. Annual convention, Cooperstown, N. Y., September 8-11.

American Electrochemical Society. Semi-annual meeting, Denver, Colo., September 9-11.

American Institute of Electrical Engineers. Pacific Coast convention, Vancouver, B. C., September 9-11.

Northwest Electric Light and Power Association. Annual convention, Seattle, Wash., September 10-12.

Pennsylvania Section, National Electric Light Association. Annual convention, Delaware Water Gap, Pa., September 16-18.

National Association of Corporation Schools. First annual convention, Dayton, O., September 16-19.

New England Section, National Electric Light Association. Annual convention, Hotel Vermont, Burlington, Vt., September 17-19.

Illuminating Engineering Society. Annual convention, Pittsburgh, Pa., September 22-26.

Association of Iron and Steel Electrical Engineers. Annual meeting, New York, N. Y., September 22-27.

Colorado Electrical and Industrial Exposition, Auditorium, Denver, Colo., October 4-11.

Colorado Electric Light, Power and Railway Association, Eleventh annual convention, Denver, Colo., October 6.

Telephone Pioneers of America. Annual meeting, Chicago, Ill., October 13-17.

Jovian Order. Annual convention, Hotel Astor, New York, N. Y., October 14-16.

Railway Signal Association. Annual convention, Nashville, Tenn., October 14-17.

Electrical Exposition and Motor Show of 1913. New Grand Central Palace, New York, N. Y., October 15-25.

Association of Railway Electrical Engineers. Annual convention, Hotel La Salle, Chicago, Ill., October 18-24.

Electric Vehicle Association of America. Annual convention, Hotel La Salle, Chicago, Ill., October 27-28.

With the Electrical Manufacturers

H. W. Johns-Manville Company, New York City, has ready for distribution a circular describing its molded weatherproof lamp sockets. These are of several types, of which the data and prices are given.

Edwards & Company, 140th and Exterior Streets, New York City, has put on the market a new table-clamp push-button for use on dining-room tables, flat-top desks, etc. It is neatly finished and unobtrusive. It clamps easily over the edge of the table without marring it. A circular describing it can be had on application to the company.

Union Switch & Signal Company, Swissvale, Pa., has been awarded the contract for the installation of electric automatic signals in the five tunnels on the middle division of the Western Maryland Railroad between Cumberland and Hagerstown, Md. The division embraces 80 miles of track and the automatic signal system will cover 13.5 miles of the distance.

The Flour City Ornamental Iron Works, Minneapolis, maker of the well known Corinthian lamp standards, has been forced, owing to the growth of its business, to materially increase its plant. A new machine-molding foundry with a floor space of 150 feet by 75 feet, a pattern and model shop two stories high, covering a ground space of 110 feet by 60 feet, and a new sand-blast house, 30 feet by 40 feet, have just been erected.

Reynolds Electric Flasher Manufacturing Company, Chicago and New York City, has issued its new bulletin No. 27 on Reco flashers. This is practically a catalog, as it covers 32 pages profusely illustrated with half-tones of many types of flashers and typical flashing signs with novel effects, as well as wiring diagrams of the manner in which some of the effects are produced. Flasher parts are also illustrated and much useful information on flashers is given.

Stone & Webster Engineering Corporation, Boston, Mass., has been selected as the constructing engineers of the new buildings for the Massachusetts Institute of Technology, to be erected in Cambridge, Mass. This selection is in keeping with the Institute practice of securing the service of able graduates, prominent officials of Stone & Webster organization, being alumni of that institution. The president of the Engineering Corporation, Dwight P. Robinson, is a graduate of Technology, in the class of 1892.

The Lansden Company, Newark, N.

J., manufacturer of auto trucks and electric wagons, has filed through its counsel, a schedule showing claims amounting to $193,000 held by some 300 creditors, in the bankruptcy court at Newark. The Lansden Company was organized in 1904 by Thomas A. Edison. A year ago new interests obtained control. The capital was increased to $1,000,000, and a new factory established. A branch plant was also established at Allentown, Pa. The company consented to an immediate adjudication upon the filing of a bankruptcy by the Crescent Auto Company of New York. George Paddock, of the Paddock-Zuzi Motor Company, is the receiver.

General Electric Company, Schenectady, N. Y., has recently added to its array of publications the following: Bulletin A4139, which is devoted to central-station oil switches of high rupturing capacity; these type F, forms H3 and H6, switches are made both automatic and non-automatic, and for voltages from 15,000 to 70,000; the bulletin describes the switches in detail and contains a list of some of the central stations in which they are in use. Bulletin A4130 is descriptive of adjustable-speed direct-current motors, which are designed to meet the requirements of individual drive of machine tools; the bulletin illustrates these motors and their application in considerable detail, and contains various curves showing the horsepower outputs at various speeds. Bulletin A4124 is devoted to a detailed description of automatic starters for alternating-current motors; the bulletin describes automatic control panels for squirrel-cage and slip-ring induction motors, float switches for remote control of automatic starting panels or rheostats, and pressure governor panels, also for remote control. Bulletin A4093 illustrates and describes generators for electrolytic work. Bulletin A4135 is entitled "Lightning Arresters for Electric Railways."

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has issued a number of new publications, of which leaflets Nos. 3572 and 3660 briefly describe the electrification of the New York extension of the Pennsylvania Railroad, and of the New York, New Haven & Hartford Railroad, respectively. These leaflets cover the salient points of both roads together with a description of the more important parts of the equipment; they are well illustrated and contain maps showing the territory covered by both of the electrified systems. Leaflet No. 3571 relates to commutating-pole rotary converters; it describes in some detail this type of converter, explaining its advantages with particular reference to the commutating pole and the method of starting. Catalogue section No. 3049 entitled "Electric Arc Welding Processes" is a reprint of an article recently appearing in the technical press by C. B. Auel. This paper, which is well illustrated, explains the different processes employed in arc welding, their advantages and limitations, and gives some interesting figures of comparison of arc and blacksmith welding. Leaflet No. 3685 covers type SK direct-current commutating-pole generators from 1.5 to 200 kilowatts, 125-250 volts; these generators have rolled-steel frames, low operating temperature, and large overload capacity. Leaflet No. 3517 is devoted to Westinghouse portable substations, which are in successful use on several electric railways throughout the country; descriptions of typical equipment and views of the same, and of several complete substation outfits are given. A booklet describing Westinghouse electrical equipment for gasoline automobiles has also been issued; this covers electric starting, lighting and igniting outfits, automobile meters, battery-charging vibrating rectifiers, tire vulcanizers, tire pumps and other motor-driven devices for garages.

Record of Electrical Patents.

Issued by the United States Patent Office, August 5, 1913.

1,069,095. Dynamo-Elelectrical Machine. D. H. Andrews, Newton, and E. C. Ketchum, Boston, Mass. Consists of disks with peripheral copper bands and insulating members between the disks with tapered edges extending beyond the perpheries.

1,069,121. Process of Heating Water. R. R. Foster, Colton, Cal. An electric heater radiates heat down on a surface of water.

1,069,125 and 1,069,126. Electric Switch. M. Guett, assignor to Hart & Hegeman Mfg. Co., Hartford, Conn. Relate to operating mechanism of push-button switches.

1,069,150. Sign. J. W. Larson, Grand Island, Nebr. A rotatable electric sign with lamps in several compartments, a collector ring and brushes.

1,069,151. Process for the Production of an Insulating Coating on Electrical Conductors. J. Loewenthal, Berlin, Germany. Consists in electrolytic precipitation on the wire of strongly adhering aluminum compounds from a solution of aluminum acetate.

1,069,165. Railway Safety Apparatus. D. Nix, Ferriday, La. Electric control for steam throttle and air brake of locomotive.

1,069,169. Separating Apparatus. H. Parker, assignor to Improved Paper Machinery Co., Nashua, N. H. Particles of solid material are separated from the fluid in which they are in suspension by an electrolytically produced gas.

1,069,187. Method of and Means for Measuring Power in Electric Circuits. H. J. Ryan, assignor to General Electric Co. The instrument draws an inclosed diagram whose co-ordinates in one direction are proportional to voltage and those at right angles thereto are proportional to current.

1,069,197. Machine for Electrically Welding Wire Fabrics. H. L. Smith, assignor to Clinton Wire Cloth Co., Boston, Mass. Resistance welder whose welding jaws are directly connected to the transformer secondary.

1,069,208. Trolley. S. F. Walker and A. W. Walton, Butte, Mont.; said Walker assignor to said Walton. Has wire-finding fingers hinged back of the wheel.

1,069,211. Electrolytic Meter. E. Weintraub, assignor to General Electric Co. Has a mercury anode and an osmotic membrane separating it from the electrolyte, which contains potassium sulphocyanate.

1,069,252. Electric Furnace. A. Helfenstein, Vienna, Austria-Hungary. The container forms part of the secondary circuit of a transformer.

1,069,255. Glass Furnace and Process. P. L. T. Héroult, La Praz, France. An electric furnace with carbon terminals on opposite sides of the hearth and a molten-metal electrode over each of the carbons.

1,069,259. Transformer. S. E. Johannesen, assignor to Westinghouse Electric & Mfg. Co. An air-blast transformer with special ventilating passages.

1,069,276. Automatic Recording Scale. E. McGarvey, assignor to International Electric Co., Bellefonte, Pa. Has contacts along the beam engaged by a sliding pivoted contact.

1,069,279. Motor Vehicle. M. Moskowitz, Montclair, N. J. Includes a fuel engine, a generator driven thereby and adapted to act as a motor to start the engine when supplied from a storage battery.

1,069,291. Electromagnetic Motor. H. A. Rhodes, assignor to Universal Motor Co., Denver, Colo. Circularly arranged stationary electromagnets surround a rotating-magnet armature and are alternately energized and de-energized.

1,069,295. Electric-light Fixture. R. C. Sage and J. R. Fruit, Boise, Idaho. Counterweight and pulley arrangement for a cord adjuster.

1,069,305. Process for Electrolytically Refining Copper. G. D. Van Arsdale, East Orange, N. J. Electrolyte contains copper in the cuprous state and a soluble sulphite.

1,069,307. Telephone-Receiver Holder. A Wetzel, Los Angeles, Cal. An adjustable bracket to hold the receiver to the user's ear.

1,069,310. Lighting Arrester. A. J. Wurts, assignor to Westinghouse Electric & Mfg. Co. A horn gap whose diverging tips are of higher resistance than the body.

1,069,326. Smelting Furnace. O. S. Emberg and O. J. D. Emberg, Chicago, Ill. Electric furnace with continuously renewable electrodes.

1,069,331. Switching Device. F. W. Harris, assignor to Westinghouse Electric & Mfg. Co. Circuit-breaker with no-voltage coil and toggle acting against a powerful spring.

1,069,347. Selective Signaling System. A. C. Reid, Genoa, Ill., assignor to Hall Switch & Signal Co. A relay operates a step-by-step selector at each substation.

1,069,355. Apparatus for Localizing the Radiant Point of Electromagnetic Waves. N. Tanaka, Wilkinsburg, Pa. A wireless receiver with several detector-energized electromagnets influencing a needle.

1,069,357. Speed-regulated Brake. W. V. Turner, assignor to Westinghouse Air Brake Co., Pittsburgh, Pa. A normally-open-circuit generator driven from the axle regulates the pressure in the brake cylinder.

1,069,369. Apparatus for Grinding,

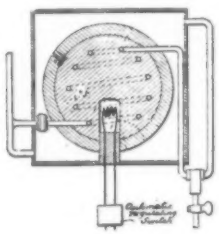
Smoothing, and Polishing Plate-glass. E. Bagnall, assignor to Zoffer Plate Glass Mfg. Co., Pittsburgh, Pa. Has motor-driven air-exhauster rotating with the table.

1,069,371. Method and Apparatus for Heating. G. G. Bell, London, and J. St. V. Pletts, Teddington, England, assignors to Electric Heat Storage Co. A small current is applied to a heat-storage stove almost continually except at peak load.

1,069,372. Apparatus for Heating Water and Other Liquids or Fluids. G. G. Bell, assignor to Electric Heat Storage Co. Adaptation of above; provides also for preliminary heating of the water.

1,069,373. Electric Heat-Conserving, Heating, and Cooking Apparatus. G. G. Bell, assignor to Electric Heat Storage Co. Combination heat-storage oven and water heater, the water serving as auxiliary heat accumulator.

1,069,374. Method of Producing Hot Water by Means of Electricity and Apparatus Therefor. G. G. Bell, and J. St. V. Pletts, assignors to Electric Heat Storage Co. Electric heat-storage



1,069,374—Electric Heat-Storage Water Heater.

means for heating a small quantity of water to high temperature, and a large quantity moderately by excess heat, the heated waters being mixed to get any desired temperature at the outlet. (See cut).

1,069,375. Heat-Storage Device for Heating Water or Other Liquids. G. G. Bell, assignor to Electric Heat Storage Co. Describes construction of the apparatus.

1,069,376. Cooking Apparatus. G. G. Bell, assignor to Electric Heat Storage Co. An inclosed and heat-insulated oven heated by air circulated through an electric heat-storage stove.

1,069,377. Apparatus for Cooking and for Carrying Out Like Operations by Means of Electricity. G. G. Bell, assignor to Electric Heat Storage Co. A modification of the above in which both air and steam are electrically heated and circulated through and about the oven.

1,069,378. Method and Apparatus for Heating. G. G. Bell and J. St. V. Pletts, assignors to Electric Heat Storage Co. Amplification of No. 1,069,374, relating particularly to means for withdrawing the mixed water from a common outlet.

1,069,401. Electrical Apparatus. S. M. Esler, McHenry, Ill. Electromagnetically actuated gear.

1,069,425. Electric Switch Box. L. B. Hornbeck, Minneapolis, Minn. A wall box with special flange to receive the ends of the lath and an adjustable sleeve to cover the plaster. (See cut).

1,069,438. Thermostat for Controlling Furnaces. L. A. Larson, Minneapolis, Minn. Electrically actuated.

1,069,440. Domestic Cooker. J. Lawrence, New York, N. Y., assignor to Electric Heat Storage Co. Electric heat-storage cooker.

1,069,441. Oven. J. Lawrence, assignor to Electric Heat Storage Co. Employs the electric heat-storage principle.

1,069,458. Telephone-Locking System. W. A. Morse, North Grosvenor Dale, Conn. Electromagnetically controlled lock for receiver hooks on party lines.

1,069,472. System of Electric-Motor Control. C. Renshaw, assignor to Westinghouse Electric & Mfg. Co. Current-limit and time-limit relays control electromagnetic switches.

1,069,493. Chemical Generator of Electricity. O. Sozzi, Naples, Italy. Primary battery with adjoining cells electrically and mechanically connected.

1,069,518. Switch. W. J. Barnett, Richmond, Va. A knife switch has an inclosing cover with a slot through which the handle moves and locks in notches.

1,069,519. Trolley. S. A. Bemis, deceased, by E. M. Bemis, executrix, Springfield, Mass. Covers details of the harp construction.

1,069,531. Electric Switch. L. G. Copeman, Flint, Mich. Knife switch with spring for quick make and break.

1,069,535. Facsimile Telegraph. F. DeBernochi, Turin, Italy. Includes a deflecting galvanometer with a conducting arm for grounding an oscillating circuit by engaging a terminal in its path.

1,069,537. Fly Trap. S. C. Dorland, Norman, Okla. Within openings in the case are platforms connected to opposite sides of a circuit.

1,069,558. Coin-controlled Taxicab-Controller. W. L. Majors, St. Louis, Mo., assignor of one-half to A. M. Turnbo. Includes an electrically actuated signal.

1,069,561. Igniting Mechanism for Internal-combustion Engines. A. L. Moeller, Mishicot, Wis. Electric sparker.

1,069,582. Electric Sign. F. Schaefer, Pittsburgh, Pa. Comprises adjoining solenoids controlling shutters.

1,069,610. Circuit-changing Device. W. H. Gaulke, assignor to Independent Electric Mfg. Co., Milwaukee, Wis. Motor starter with no-voltage release and separate short-circuiting switches sucessively actuated by cams.

1,069,616. Dental Vulcanizer. A. C. Hulbert, Santa Rosa, Cal. Has an electric heater.

1,069,627. Electric Sign. A. C. Meyer, San Diego, Cal. A switchboard with series of electric contacts on its outer face and an open reciprocating frame holder.

1,069,629. Amusement Apparatus. C. Nichols, Kansas City, Mo. Electric lamps are provided on a representation of a baseball diamond.

1,069,635. Electric-Box Connection. F. H. Ward, Brooklyn, N. Y. Between a pair of entrance bushings is a traveling binder for wedging flexible armored conduit.

1,069,661. Switch. V. H. Carman, Indianapolis, Ind., assignor to Carman & Fryer. A three-phase knife switch with auxiliary blades and contacts.

Patents That Have Expired.

Following is a list of electrical patents ((issued by the United States Patent Office) that expired August 11, 1913:

565,446. Electrically Operated Shedding Mechanism for Looms. E. Gates, Philadelphia, Pa.

565,447. Electrically Operated Jacquard Mechanism for Looms. E. Gates.

565,448. Electrically Operated Reed for Looms. E. Gates.

565,449. Magnetic Shuttle-Motion for Looms. E. Gates.

565,453. Electric Railway. W. Grunow, Jr., Bridgeport, Conn.

565,529 and 565,530. Dynamo-Electric Machine. E. Caemmerer and F. G. Mayer, Chicago, Ill.

565,541. Socket for Incandescent Lamps. H. Hubbell, Bridgeport, Conn.

565,571. Electric Cigar-Lighter. F. W. Schindler-Jenny, Kennelbach, Austria-Hungary.

565,574. Electric Heater. R. Van R. Sill, Cleveland, O.

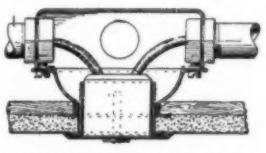
565,576. Method of Manufacturing Incandescent Lamps. F. S. Smith, Pittsburgh, and J. A. Vandergrift, Allegheny, Pa.

565,624. Electric Conduit Railway. J. B. Linn, Cleveland, O.

565,627. Telephone-Exchange System. A. F. W. Meyer, Blue Island, Ill.

565,647. Armature for Dynamo-Electric Machines. D. P. Thomson and A. H. Armstrong, Schenectady, N. Y.

565,657. Photographic Telegraph-Recorder. C. Ader, Paris, France.



1,069,425—Wall Switch Box.

565,662. Electric Switch. C. Bach, Jr., Milwaukee, Wis.

565,671. Electrical Vegetation-Exterminator. M. S. Cummings, Thomasville, Ga.

565,673. Electric Switch. W. L. Denio, Rochester, N. Y.

565,727. Charging and Discharging Secondary Batteries. E. N. Dickerson, New York, N. Y.

565,739. Electrically Operated Stringed Musical Instrument. W. H. Gilman, Boston, Mass.

565,740. System of Electrical Distribution. F. D'A. Goold, New York, N. Y.

565,741. Storage-Battery System. F. D'A. Goold.

565,761. Electric Time-Alarm. H. E. Lipscomb, Richmond, Va.

565,775. Advertising Electrical Phosphorescent Letters or Signs. D. McF. Moore, New York, N. Y.

565,776. Phosphorescent Electrical Illumination by Metallic Coating Upon Glass. D. McF. Moore.

565,777. Phosphorescent Electric Illumination by Secondary Currents. D. McF. Moore.

565,811. Switchboard for Electrical Distribution Systems. L. B. Stillwell, Pittsburgh, Pa.

565,823. Multiple Switchboard. R. McG. Andrews, Richmond, Va.

565,861. Electric Arc Lamp. J. A. Mosher and W. S. Bartholomew, Chicago, Ill.

565,862. Fitting for Incandescent Electric Lamps. J. McFarlane, Glasgow, and W. B. Edgar, Partick, Scotland.

565,867. Cutout for Electric Motors. E. P. Warner, Chicago, Ill.